Chapter 3

Affected Environment and Environmental Consequences

Introduction

This chapter summarizes the existing condition of physical, biological, and social resources in the Lower Clover area and explains how they may be affected by Lower Clover alternatives. The analysis tiers to the Final Environmental Impact Statement for the Land and Resource Management Plan of the Monongahela National Forest, which described the general effects activities on Monongahela National Forest System lands may have on vegetation, wildlife, water, soils, recreation, etc. (FEIS, pp. 4-1 to 4-59). It also tiers to the analyses completed for subsequent amendments, especially the 1991 Environmental Assessment for Oil and Gas Leasing and Development Monongahela National Forest and the 2004 Environmental Assessment for the Threatened and Endangered Species Amendment.

The effects of the alternatives are discussed in terms of direct effects (effects that are caused by the action and occur at the same time and place), indirect effects (effects that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable), and cumulative effects (effects on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes the other actions). The methodologies used to evaluate effects are briefly mentioned in each section; more details may be documented in individual resource reports in the project file.

Past, Present, and Reasonably Foreseeable Future Actions

The actions listed in the following table are activities of the Forest Service and other entities that have occurred within or around the Lower Clover project area in the past, are currently being implemented, or may be implemented in the reasonably foreseeable future (next five years or so). Depending on the resource affected, all or only some of these actions may contribute cumulatively to the effects of Lower Clover activities.

Table 3-1: Past, Present, and Reasonably Foreseeable Future Actions within or around the Lower Clover project area.

Action	Past	Present	Reasonably Foreseeable
Timber harvesting within the Lower Clover Watershed at the turn of the 20th century, prior to federal ownership.	x		
Government activities in 1950s that affected 79 acres.	x		
Government activities in 1960s that affected 74 acres.	x		
Government activities in 1970s that affected 572 acres.	x		
John Hog Timber Sale, completed in 1995 (FS). This sale was implemented within the project area. It affected 113 acres and involved 1.8 miles of road.*	x		
North Pheasant Timber Sale, completed in 1996 (FS). This sale was implemented within the project area. It affected 115 acres and involved 1.2 miles of road.*	x		

Table 3-1: Past, Present, and Reasonably Foreseeable Future Actions within or around the Lower Clover project area.

Action	Past	Present	Reasonably Foreseeable
New Pheasant Timber Sale, completed in 2003 (FS). This sale was implemented outside the project area but within the watershed. It affected 383 acres and 3.5 miles of road.*	x		
Harper Cemetery Timber Sale, completed in 1992 (FS). This sale was implemented outside the project area but within the Lower Clover watershed. It involved approximately 109 acres.	x		
Hobson/Laurel Timber Sale, currently active. This sale is being implemented outside the project area but within the Lower Clover watershed. It started in 2002 and may be complete by 2006 (FS). It involves 387 acres and 7.3 miles of road.*	x	x	x
Timber harvests on private lands in Mill Run, Indian Run, Valley Fork, Smoky Hollow and others. WV Division of Forestry reports that 10 permit applications for logging have been requested in the past five years (1999-2004). Total acreage was 593 acres, of which 559 in the Left Fork of Clover and 34 in the Right Fork of Clover. All were identified as diameter limit or marked tree sales. The amount of timber harvesting that may occur on private lands in the foreseeable future is not known, but it is reasonable to expect that past silvicultural methods (selection cuts) and logging methods (conventional, skidder logging) would be the means of accomplishing future cutting.	x	x	x
As a part of the Indian Run Project, the FS did watershed restoration work including: stoning, installed culvert and dips on about 1 mile on SR 8 for sediment control; installed a concrete arch culvert on SR 8 in the Left Fork of Clover replacing a smaller-diameter round culvert; and road closure and rehabilitation of 3/10 mile of a woods road in the Left Fork of Clover Run.	x		
Temporary bridge installed eliminating ford on Valley Fork Run and 0.5 miles of FR 137 was stoned in 2002/03.	x		
Harper Cemetery Road (FR 937) was fully stoned 2003.	x		
FR 767 is seasonal road that is opened for approximately 1.7 miles from October to December for hunter access.	x	x	x
The Forest is considering a proposal to create and maintain water holes and wildlife openings in the Lower Clover area, the location and extent of which have not been determined.			x
Corridor H, a four-lane highway, may cut across the southern end of the project area. Construction anticipated after 2013.			x
Wildcat gas wells: Two wells drilled (one in 1977, other drill date unknown) on private land. Both were dry holes and are now plugged and abandoned.	x		

Table 3-1: Past, Present, and Reasonably Foreseeable Future Actions within or around the Lower Clover project area.

Action	Past	Present	Reasonably Foreseeable
T&F Operating gas well and pipeline: Well drilled and gas pipeline installed about 2002 on private land. Operation and maintenance continues.	x	x	x
Gas pipeline: Pipeline installation operation and maintenance of 25 foot ROW containing small diameter pipeline on NFS and private land. The canopy is closed.	x	x	x
MegaEnergy gas well & pipeline: Well drilled and gas pipeline installed 2002-2003 on private land. Operation and maintenance continues.	x	x	x
Based on State records of permitted gas wells, there may be one new gas well drilled on private land in the future in the eastern portion of the Lower Clover Project area, in a watershed that drains into the Cheat River.			x
Residential development along floodplains on private lands.	x	x	
Stream channelization by non-federal entities.	x		
Agriculture activities such as pasture lands and small gardens (including two Forest Service hay cutting and one cultivation Special Use Permit)	x	x	x
Recreation activities such as hunting, fishing, hiking, camping, wildlife viewing, driving for pleasure, berry picking, etc.	x	x	x
Road maintenance of approximately 55 miles of State Roads and Highways and about 14 miles of Forest System roads	x	x	x

*The harvest methods used and drainages affected by these sales are documented in the 01/30/2004 Lower Clover Timber History Report.

In the future, additional development and disturbances may occur, such as timber sales on private lands or gas well drilling. However, the Forest is not aware of any specific plans or the extent of such activities.

Presence or Absence of Potentially Significant Resources

The following potentially significant resources are not present in the Lower Clover project area: coastal zone areas; research natural areas; State or national parks, conservation areas, or other areas of ecological, scenic, or aesthetic importance; wild and scenic rivers; or wilderness. There are also no Native American concerns associated with proposed activities or minority and low-income populations that would be adversely affected.

Floodplains, prime farmlands, and heritage resources exist in the project area. Floodplains and prime farmlands would be affected, but the effects would be limited (see Soil and Hydrology/Watershed effects). Heritage resources would not be adversely affected because they would be avoided (see Heritage effects). The effects to migratory birds and threatened, endangered, and sensitive species are documented later in this chapter. None of the alternatives are expected to result in short or long term adverse effects to these species' population viability.

Physical Resources

Soils/Geology

Resource Impacts Addressed

This section summarizes the existing condition of soil resources in the project area and how proposed activities may impact them. It specifically describes the effects activities may have on acid deposition, soil compaction, erosion, and vegetation/nutrient removal. It also indicates whether soils in the area are capable of supporting the regeneration and road use proposed, and it explains how herbicide use may affect the soil resource.

Affected Environment

Chemung and Hampshire geology exists within the project area. Soils formed from these formations are moderately susceptible to compaction. They have a moderate to low shrink-swell potential and moderate to low shear strength potential, factors are important in determining the capacity of soils to support road and skid road use in the area.

The Chemung geology weathers into soils that have numerous rocks throughout the soil profile and fractured bedrock; these soil properties provide for somewhat stable road surfaces during drier periods of the year. Winter time freeze thaw cycles, which happen quickly in this area of the Monongahela, can affect soils ability to support log truck traffic. Monitoring in this area indicates that temperatures often warm up by noon enough that road surfaces begin to thaw, making them more susceptible to soil and water resource damage from log truck hauling.

The soils in this area support mesic northern hardwood species and a diverse understory of herbaceous species. About 11 acres of prime farmland exist in the project area.

The project area is characterized by predominantly steep slopes; much of the terrain exceeds slopes of 40 to 50%, and some slopes exceed 70%. Few floodplains exist in the area, except along the largest streams (like Clover Run). The soils throughout much of the area have weakly formed fragipans and perched water tables, so only the upper portions of the soil profile have any appreciable water storing capacity. They are moderately to well-drained soils and have moderate to severe sensitivity from the standpoint of erosion and slippage potential. Steep slopes, coves, and riparian areas in the project area are the most sensitive to natural erosion processes. Soil disturbances in these areas would have a greater potential to affect hydrologic functions and stream conditions than other areas within the project area.

Descriptions of climate and watershed conditions, which can influence soil resources, are described in the project area description in Chapter 1 and the Watershed effects section. The Monongahela National Forest has been, and continues to be, the recipient of some of the highest sulfate and nitrate deposition in the nation, mainly due to its location downwind of many old coal-fired power plants in Ohio, Pennsylvania, Indiana, Illinois, and West Virginia. The combination of high emissions and limited buffering capacity of certain geology and soil types found on the Forest has led to increased acidity in stream water and possible nutrient depletion in soils. However, the effects of acid deposition in the Lower Clover project area do not appear to be noteworthy. The geochemistry of the Chemung geologic formation shows that there are weatherable minerals present that currently contribute some alkalinity to the soil system, thereby buffering the acidic inputs from deposition. This is evident in the stream chemistry and the soil chemistry (NRCS soil sample analyses for the Tucker County soil survey update, NSSC

laboratory database, 2002). Also, many forbs and shrubs that require more alkaline environments to thrive are present in under story vegetation throughout the project area.

Scope of the Analysis

The scope of the direct effects would be the exact location of the activities to take place within the watershed (see Alternative B and C maps for unit and road locations). For instance, the direct effects to the soil resource from a helicopter landing would be the area used as the landing. The scope of the indirect effects would be the Lower Clover Run project area; this scope was chosen because impacts to the soil resources, such as landslides and minor mass wasting, can move from the site but not typically out of the watershed. The scope of the cumulative effects may extend beyond the project area to activities occurring within the 5th order watershed.

With regard to time, effects to soils can be relatively short lived such as (1) increases in soil moisture from harvesting, which last only a year or two until new vegetative growth occurs or (2) slight disturbance of the soil organic horizon that may cause a temporary disruption in decomposition processes. Soil effects can be much longer such as the reduction of compaction in skid roads; compaction on skid roads would not be reduced until timber harvest activities were completed and soils were ripped. This could occur from five to seven years after a timber sale is completed. If not ripped after use, compaction on skid roads could have long term effects for a hundred or more years.

Methodology

Soil samples were collected and data was used from the existing Geographic Information System database, past forest information on history and use of the area, field visit information, and information found in the Tucker County Soil Survey Report. The description of anticipated impacts to the soil resource was based on the sensitivity of the soils and the amount of soil disturbance that would occur from proposed activities. Estimates were made for each alternative regarding the percent change in soil productivity to determine whether proposed activities would exceed a Regional 15% criterion for a decrease in soil productivity.

Environmental Consequences Common to All Alternatives

Alternative B and C propose the same amount of log landing and road activities in the same locations; thus, their effects to soil resources would be the same. Approximately 22 acres of soil or about 0.4% of the project area may be impacted by log landing development, construction of temporary roads, road improvements on FR 767, 767B, 859; abandonment, construction, and reconstruction on TR 125 (see Aquatic effects). There is risk for soil compaction, erosion, and sediment delivery to streams whenever soil is disturbed, but due to the small acreage being disturbed, and for reasons explained on the following pages, log landing development and proposed road activities are not expected to result in substantial, adverse effects to soil resources.

Soil compaction is expected to be a direct effect of developing landings and road activities. Equipment used as part of the timber sale and the piling of logs on landings are expected to compact soils. The potential for severe soil compaction, rutting, and ponding of water is high if measures identified in Chapter 2 are not implemented, especially during periods of freeze-thaw conditions when soils are saturated. The soils that roads and landings would be affecting are capable of supporting proposed use, but to ensure their soil strength and stability when soils are saturated, rock may need to be added (see measures in Chapter 2). Also, roads and landings may need maintenance to drain water off during use (see measures in Chapter 2); this would help minimize rutting. Compaction on roads would last as long as they are used as roads.

Compaction on landings would last until harvesting is completed, and they are ripped and seeded (up to five to seven years from the date a sale is awarded). If they are not ripped after use, compaction on skid roads could have long term effects for a hundred or more years.

Soil erosion may be an indirect effect of developing log landings, constructing temporary roads, improving FR 767, 767B, and 859, and abandoning, constructing, and reconstructing TR 125. Soil erosion would occur if soil compaction prevents water from filtering into a landing or road's surface and water begins to flow over bare soils. Overland flow of water could lead to stream sedimentation (see Aquatic effects). Erosion effects of developing log landings and roads are described below.

The effects of overland flow of water, erosion, and sedimentation from log landings are expected to be minimal. Landings are proposed in areas of fairly level ground. Five of the possible landings (landing a, b, d, e, and f) have previously been used as clearings and exist on or below ridge tops, away from streams. Although vegetation covers many of them now, some of them have been stoned in the past and would support proposed use; rock may or may not need to be added depending on the time of year they are used (dry season versus winter). The other three landings (landings c, h, and i) are proposed near stream riparian areas. The effects of these landings are summarized below:

- Landing c - Risks of overland flow of water, erosion, and sedimentation from landing c are low. Landing c is proposed for a high terrace in an existing hay field. It does not have a high water table, nor is it in immediate risk of flooding.
- Landing h – The risks of overland flow of water, erosion, and sedimentation from landing h are low. It has well-drained soils that are suitable for use as a landing.
- Landing i - The risks of severe compaction, rutting, ponding of water, overland flow of water, erosion, and sedimentation are high without the hardening of the soil surface (see measure identified in Chapter 2). The soil types that exist in landing i have little to no rock fragments in the subsoil. The soil is greater than five feet deep to bedrock and appears to be colluvial.

The effects of overland flow of water, soil erosion, and sedimentation from road developments would vary depending on the road being affected. On all roads, effects are expected to be the greatest while culverts are being added, removed, or replaced, or while cut and fill banks are being disturbed. There is a slight to moderate risk of destabilizing the toe-slope when soil material is removed from ditches. During these soil disturbing activities, soil may enter ditch lines and a flush of sediment may flow into nearby streams; this would be a short term, adverse effect. In the long term, these activities would be expected to have some beneficial impact in that removing debris and sediment from clogged culverts or installing more or larger culverts could reduce the potential for future road related soil erosion problems and long term sediment effects.

Given the few acres being disturbed in the project area and the road design and mitigation that would be implemented, the effects of road related disturbances are not expected to be great (see Aquatic effects and Chapter 2). Once these soil disturbing activities have ceased, stone would be added to Forest System road surfaces; temporary roads and log landings would remain stoned or be ripped and seeded. These activities would greatly reduce the chance of overland flow, soil erosion, and sedimentation.

Construction, reconstruction, and abandonment of segments of TR 125 are expected to have some distinct soil impacts not expected for most roads in this area. This is because road work on TR 125 may disrupt hydrologic flow patterns through colluvial soils (a type of soil that is prone to erosion and slope failures); and water flow may be redirected in unexpected areas.

Water appears to move readily through the soil and the mountainside where TR 125 is proposed. This would indicate these soils have water tables that rise and fall with precipitation events. The road is proposed in areas where ground water and surface water rises in the form of seeps or springs during heavy periods of rain or during times of soil saturation. The following effects could occur:

- Relocating the intersection of TR 125 with SR 72 could affect subsurface flows and result in soil erosion. During very wet periods, "artesian like springs" currently flow from the ground at the proposed intersection. Mitigation is identified in Chapter 2 that would reduce the chance of soil erosion and stream sedimentation impacts.
- Construction and reconstruction of TR 125 could result in soil erosion and slope failure. If erosion and slope failure occurs, a large amount of sediment could enter the ditch lines of TR 125 and be deposited in a couple of unnamed, intermittent streams. The extent of possible erosion cannot be predicted, but several road locations were considered, and the proposed design is expected to have the least potential for erosion potential. Mitigation is identified in Chapter 2 that would reduce the potential for adverse soil erosion and sedimentation.
- Abandoning about 0.5 mile of TR 125 would disturb soils and could result in short term effects such as is common for most roads. It would have a long term beneficial impact in that existing soil erosion would be reduced or eliminated and riparian habitat currently impacted would no longer be impacted.

The effects of overland flow of water, soil erosion, and sedimentation from road use is expected to be slight if timber hauling on temporary roads and FR 767, FR 767B, FR 859, TR 125 occurs during times of less precipitation such as May through September. However, helicopter logging is normally performed when leaves are off the trees, in the winter; so these roads are likely to be used during periods of high precipitation and freeze-thaw conditions.

If logs are hauled on these roads in wetter periods (which is more common between October and April), there is a much greater chance for overland flow of water, soil erosion, and sedimentation. As an example, soil samples taken on TR 125 in 2004 indicated soils were not frozen underneath snow pack even though temperatures ranged from single digits to the low twenties for more than a two-week period. If roads in the area are used in the winter and soils are not frozen, log truck traffic could cause surface ponding, extensive rutting, severely disrupt soil structure and porosity, adversely alter local groundwater hydrology and riparian function, and provide conduits for runoff. This could potentially result in a risk of road failure (head cuts on the down slope position, slippage and slumping, potholes, and degradation of the sub grade) if soils become saturated. Mitigation is identified in Chapter 2 that would reduce the chance that road use during wetter seasons would cause soil erosion and sedimentation.

Log landing development and road activities are not expected to noticeably affect vegetation/nutrient removal. These activities' effects on vegetation/nutrient removal would occur on less than about 22 acres of soil or about 0.4% of the project area; most affected areas

have little to no vegetation growing on them now, most of the existing roads are currently rocked.

Under both alternatives, about 1.5 acres of the 11 acres of prime farmland in the project area would be affected by the use of proposed helicopter landing "c" (see effects described in the Special Use effects section). A Farmland Conversion Impact Rating was completed to assess impacts to Prime and Statewide Important Farmland. From this assessment, it was determined that the project would not qualify for protection under the FPPA (NRCS Correspondence, 08/24/04). Thus, neither alternative would result in substantial adverse effects to prime farmlands.

Direct/Indirect Environmental Consequences

Alternative A – No Action

Soil resource conditions would remain the same as described in the affected environment section. Alternative A would not implement activities that would compact, rut, or erode soils, change nutrient cycling, or impact prime farmland. Herbicides would not be used, so there would be no affect from herbicides. As mentioned in the affected environment, the effects of acid deposition in the Lower Clover project area are not substantial to the soil, water, or vegetation resources.

Alternative B – Proposed Action

The soils present in the project area are conducive to or capable of supporting the type of regeneration proposed. Felling trees, itself, is not expected to noticeably contribute to soil compaction, soil erosion, or stream sedimentation. Monitoring of past projects of similar nature with similar soil types indicate the soil surface would be slightly disturbed from tree felling. Additional disturbance could be caused by the dragging of trees, but this would be beneficial in scarifying the surface for regeneration.

Helicopter yarding of approximately 344 acres, alone, would contribute little to soil compaction, rutting, soil erosion, or stream sedimentation because no mechanized equipment would be driven over these acres.

Conventional, ground-based skidding could compact, rut, and erode soils and potentially contribute to stream sedimentation because skid road development and over land skidding would disturb soils; this is especially true if harvesting occurs when soils are saturated. However, given the small number of acres that are expected to be disturbed by skid roads (about 15 acres) and the Forest Plan standards and guidelines and mitigation in Chapter 2 that would be implemented (such as using existing skid roads as much as possible and the mitigation that indicates skid roads would not affect more than 15% of the harvest unit), such effects are expected to be minor.

Site preparation with hand tools, planting, and fencing would cause little soil disturbance; thus, there would be little effect to the soil resource from these non-commercial activities.

Proposed timber harvesting is expected to affect nutrient cycling and can remove significant amounts of nutrients from a stand; however, because of the relatively dispersed nature of the cuts, the removals are not expected to be significant, particularly for N (Adams, 1999.) The Hampshire and Chemung geologic groups that underlie much of the watershed have moderate amounts (when compared to other geologies on the forest) of weatherable minerals that add nutrients such as Mg, Ca, K, and P back into the system upon weathering. Effects of acid deposition in the Lower Clover project area in combination with proposed harvesting are not

expected to be substantial to the soil, water, or vegetation resources (see rationale under the Affected Environment).

Timber harvesting is expected to increase soil fertility from pre-harvest levels as increases in soil moisture and soil temperature contribute to an increase in organic matter decomposition. This effect would produce an increase in nutrients available to plants and soil organisms on the sites. This surge in nutrients, along with additions of N from the atmosphere and precipitation, is expected to promote rapid growth on the sites and benefit many soil-borne organisms. Possible losses of nutrients to ground water and volatilization are expected to be offset by addition of nutrient rich leafy tops and woody debris left on-site after harvest. Although frequently hypothesized, nutrient deficiencies as a result of over story removal have not been reported in the eastern hardwood forests (Adams, 1999). Therefore, no adverse impacts to soil fertility are expected from the proposed treatments.

Timber harvesting under Alternative B is expected to increase soil productivity loss within the project area to about four percent, which is nine percent less than the Regional Soil Quality standard (see Methodology section). As previously mentioned there would be little direct impact to soil productivity from helicopter harvesting or post harvest activities such as site preparation, planting, and fencing. Most effects to soil productivity would result from development of skid roads, log landings, and other areas disturbed in conventional skidding operations.

Steep slopes would be affected by proposed activities, but the design (e.g. use of mostly helicopter operations and limited road construction) and mitigation (e.g. limiting skid road development to 15% or less of any given conventional unit) that would be implemented in the project area would help reduce effects to soil resources.

Herbicide use in the project area is not expected to adversely affect soil resources in the project area. The effects of herbicides on soil productivity are well documented in the 1989 FEIS Vegetation Management in the Appalachian Mountains document prepared by Region 8 of the Forest Service. Triclopyr is readily absorbed by roots and foliage and translocated easily to meristems. This compound is metabolized by bacteria and photodegrades rapidly. Its half-life is less than 10 hours in water, but Triclopyr is more persistent in soils. It is moderately soluble and not strongly absorbed in the soil. Studies indicate that it should not be leached into the water table under normal use (Lee and others, 1986.) Glyphosate is a broad-spectrum herbicide that is very effective on a number of forest weed species. This chemical is strongly absorbed by the soil. The major degradation pathway is microbial breakdown in the soil although varying rates result in a longer half-life than some of the other common herbicides used in forest management. Glyphosate does not photo decompose to any extent and does not volatilize (Rueppel and others, 1977 referenced in the FEIS document.) Therefore, there is a risk of this chemical leaving the site and entering a stream if erosion occurs and sediment with the chemical attached to it makes it to a stream channel. Given that proper application rates would be used, timing application instructions would be followed, and riparian buffer zones would be used, the risk of contaminated sediment entering a stream channel is small.

The 1989 FEIS discusses the effects to soil productivity. It documents that use of herbicides promotes soil productivity in timber management by increasing forest productivity and by reducing erosion caused otherwise by mechanical disturbance of the soil. Summaries of literature (referenced in the FEIS) show herbicides can be stimulatory and inhibitory to microorganisms. Where adverse effects have been observed, herbicide concentrations exceeded

those measured under actual operational conditions (Fletcher and Friedman, 1986). There is a general consensus that herbicide use at normal forestry rates (as proposed for the Lower Clover area) does not reduce activity of microorganisms. There is currently no evidence that herbicides used in forest management in the South (including the MNF) produce adverse effects on site and soil productivity.

In regards to acid deposition, effects in the Lower Clover project area are not substantial to the soil, water, or vegetation resources. There is a moderate risk for acid deposition effects, but activities are not expected to affect the soils' buffering capacity (see Affected Environment description).

Alternative C

The soil effects of Alternative C would be much the same as Alternative B. The primary difference between Alternative C and B for soil disturbance is the amount of acreage affected. Fewer acres would be harvested; fewer acres would be harvested via ground-based skidding; and fewer trees would be removed from harvest units because areas would be thinned not regenerated. The result would be slightly fewer acres of soil (approximately four acres) would be disturbed under Alternative C.

Cumulative Impacts

Alternative A – No Action

Alternative A would not implement activities that would directly or indirectly disturb soils; so, it would not contribute cumulatively to the past, present, or reasonably foreseeable future activities listed at the beginning of Chapter 3.

Alternative B – Proposed Action

Past, present, and reasonably foreseeable future activities on Federal and non-federal lands (such as agricultural uses, turn of the century logging, logging since the 1920s, mineral development, and road activities) affected soil resources. Such activities, along with natural weathering and erosion brought on by annual freeze-thaw action have helped create soil conditions that exist in the watershed today. Future activities on Federal and non-federal lands (possible wildlife opening and waterhole creation; road maintenance and construction; mineral development) also would disturb soils in the watershed.

Implementing Alternative B is not expected to contribute to substantial cumulative effects to soil resources. This is because of the design of proposed Lower Clover activities (use of helicopter yarding, limits on amount of skid road development); their location primarily away from coves, riparian areas, and streams; and that less than one percent of the soils in the project area and less than 0.5 percent of the soils in the watershed would potentially be affected. Also, negative significant long-term cumulative effects to the soil resource are not anticipated because the total amount of soil disturbed in the project area would be less than ten percent of the total acreage, well below the Regional 15 percent standard (see last paragraph of cumulative effects).

The Forest Plan FEIS recognized the potential for soil compaction, erosion, and stream sedimentation effects (Forest Plan FEIS, p. 4-6 to 4-7, p. 4-13), and specified standards and guidelines in the Forest Plan, especially Appendix R (Riparian Area Management, Forest Plan, p. R-1 through R-8) and Appendix S (Soil Management Handbook, *Forest Plan*, p. S-1 through S-151) to mitigate such effects. The cumulative effect of soil compaction, erosion, and sediment deposition in stream channels from repeated episodes of earth disturbance would be mitigated to acceptable levels by use of practices identified in Forest Plan Appendices R and S and by the

additional design features and mitigation identified in Chapter 2 and Appendix A, which would further reduce the potential for adverse effects to soil and water resources. No cumulative adverse effects from nutrient leaching are anticipated from any of the alternatives.

Since the 1920's, timber harvesting activities (conventional logging and road building) on federal lands has likely disturbed approximately three and a half percent of land in the watershed. Alternative B is expected to add an additional half a percent of disturbance in the watershed on Federal land, bringing total disturbance to approximately four percent. This level of disturbance is not viewed as significant in affecting the soil resource. The exact acreage of disturbance that has occurred from past, present, and future activities on non-federal lands, or the extent of such effects on soil resources are not known. Agricultural management, residential development along floodplains, timber harvesting, gas well development, stream channelization, and road activities in the area disturb soils and reduce soil productivity. Residential development along floodplains contributes a range of soil effects in the watershed depending on the size of the disturbance area and alteration of the water table. The cumulative effect of activities on non-federal land, combined with the approximately four percent of disturbance on Federal lands is not expected to exceed 15%, which is consistent with the Regional standard that no more than 15% of the soils in an area be disturbed.

Alternative C

The cumulative effects of Alternative C would be much the same as Alternative B, except fewer acres of soil would be disturbed. The chance for contributing cumulatively to past, present and foreseeable future actions would be slightly less than Alternative B.

Unavoidable Adverse Impacts

Alternative A would not implement actions that would cause unavoidable adverse impacts, but existing erosion on TR 125 would continue. Alternative B and C would implement activities that would disturb soils, which may cause unavoidable adverse compaction, erosion, nutrient removal, and adversely affect soil productivity. However, such effects are not expected to be substantial. Less than one percent of the project area and less than 0.5 percent of the Clover Run watershed would be affected. Implementing Forest Plan direction and design features and mitigation identified in Chapter 2 and Appendix A would reduce the potential for adverse impacts. Neither action alternative would contribute substantially to the effects of past, present, or foreseeable future actions.

Irreversible or Irretrievable Commitment of Resources

Construction of roads and skid roads proposed under Alternatives B and C would result in an irreversible commitment of soil resources on approximately 21 acres until they are no longer used as skid roads. Use of proposed helicopter site "c" could result in an irreversible commitment of 1 ½ acres of prime farm land because rock added to it is likely to change the composition of the A horizon; this would likely make it ineligible as prime farm land. There would be no irretrievable commitment of soil resources.

Consistency with the Forest Plan

All alternatives would be implemented consistent with Forest Plan goals, objectives, standards, and guidelines (pp. 40, 79-80, 82, 128, Appendix R, and Appendix S).

Hydrology/Watershed

Resource Impacts Addressed

This section describes how proposed activities in the Lower Clover area may affect water runoff in storm flow, potential for flooding, and water quality. It also describes how proposed herbicide use may affect the public and aquatic biota.

Affected Environment

Nearly all of the project area lies within the fifth level hydrologic unit designated as Cheat River Direct Drains. Streams within this unit that could be affected by proposed activities include Clover Run; Brannons Run; Left and Right Forks of Clover Run; Johnson Run; Jonathan Run; Upper Jonathan Run; a short segment of the Cheat River; some smaller, perennial, un-named tributaries; and numerous smaller intermittent and ephemeral streams. A small portion of the project area (the Smoky Hollow watershed at the extreme southern end) lies within the Shavers Fork fifth level hydrologic unit.

As mentioned in the Soil effects of this EA, soils in the project area range from moderate to severe sensitivity from the standpoint of erosion and slippage potential. In terms of influencing hydrologic functions of watersheds, the portions of the project area most sensitive to natural processes and disturbances are steep slopes, coves, and riparian areas. Much of the terrain in the area exceeds slopes of 40 to 50 percent, and some slopes exceed 70 percent. Floodplains are limited to the largest streams (e.g. Left Fork Clover Run). Soils throughout much of the area have weakly formed fragipans and perched water tables; so only the upper portions of the soil profile have any appreciable water storing capacity. These soil and topographic characteristics result in limited soil water storage for stream flow supply during low flow periods.

The Lower Clover watershed receives high annual precipitation. In the Upper Clover Run watershed, annual precipitation averages about 62 inches per year (data from a long-term research project within the Clover Run watershed). This high annual precipitation combined with the steep slopes and soils of the project area make runoff within the watershed rapid, and stream flow flashy. Streams within the area have a high drainage density and generally steep gradients, which contributes to rapid runoff.

Water quality in project area streams is moderate to good, except that suspended sediment and turbidity may be high in some streams during storm runoff events. Otherwise, streams generally run clear and meet WV water quality standards for turbidity Water chemistry in area streams generally meets State standards, but biological productivity is moderate to low (see Aquatics effects). The Left Fork of Clover Run (upstream from, but near the project area) generally has near-neutral pH and moderate to low alkalinity, but adequate to support the aquatic community (USFS data, 2002). Other streams in the area have pH ranging between 6.7 and 7.6 (1996 WV data). Smoky Hollow of Shaver's Fork is the only stream in the project area listed in the State's 303(d) list of streams not meeting water quality standards; it is listed for reasons of "biological impairment," but the source of impairment has not been identified.

Scope of the Analysis

The area of analysis for direct and indirect effects is the perennial, intermittent, and ephemeral tributaries within the Lower Clover project area that have project activities proposed within their watershed boundaries. The area of analysis for cumulative effects also is the Lower Clover project area, with the addition of the remainder of the Clover Run watershed (which extends

upstream from the project area boundary) and the remainder of the Jonathan Run and Smoky Hollow watersheds because activities implemented in these areas in the past, present, and foreseeable future could contribute to effects. Any substantial or measurable influence from project area activities is not expected to extend further downstream than the limits of the project area. This is because of the limited area of proposed activities; the mitigation of effects that have been designed into the project (see list in Chapter 2); and the relative size of the Cheat River watershed (approximately 535,000 acres) in relation to the size of the project area and proposed activity acres.

The temporal boundary used for direct and indirect effects was from six to eight years or so from the time timber harvesting occurs. This is the timeframe in which effects would be expected to dissipate. The temporal boundary for cumulative effects would be the same since little cumulative effect is anticipated.

Methodology

The evaluation of effects is based on watershed management and forest hydrology studies done over several decades in the eastern U.S. and in the Appalachian Mountains from North Carolina to New Hampshire, including studies conducted on the Fernow Experimental Forest at Parsons, WV (which is about five miles from the Lower Clover project area) (Edwards and Wood, 1994; Dissmeyer, 1994; Kochenderfer et al., 1997; Kochenderfer and Aubertin, 1975; Kochenderfer and Edwards, 1991; Kochenderfer and Wendel, 1980; Kochenderfer and Helvey, 1987; Kochenderfer and Helvey, 1989; Patric, 1976; Patric, 1980; Roehl, 1962). These studies have documented the effects of harvesting timber (which frequently involves road and skid road construction) on erosion, sedimentation, and stream flows (storm flows and peak flows) in small streams that drain study watersheds (Arthur et al., 1998; Edwards and Wood, 1994; Hewlett and Helvey, 1970; Hornbeck, 1973; Hornbeck et al., 1997; Kochenderfer et al., 1997; Patric and Reinhart, 1971; Reinhart et al., 1963). The type and magnitude of expected effects within the project area were made by comparing research and project area watershed conditions, type of harvesting and roading practices, and the proportion of areas treated.

The above cited studies and professional knowledge and judgment were used to assess the direct and indirect effects of proposed alternatives on hydrologic function of stream channels, delivery of sediment, and water quality. Factors considered in the analysis included the size and location of proposed harvest units; yarding methods (helicopter versus conventional ground based yarding); location and amount of road construction, reconstruction, and skid road development; the presence of functioning stream channels and riparian areas within and near harvest areas; and the presence of sensitive landforms such as steep slopes and coves.

Road and skid road construction and timber harvesting are the activities most likely to potentially alter watershed hydrologic processes, affect sedimentation, and affect stream flow conditions, particularly storm flow and peak flow characteristics. Background information and discussion of the findings of watershed management and forest hydrology studies on sediment, storm flow, and peak flow effects have appeared in previous environmental assessments and are not repeated here. For example, discussion of the effects of forest land management on water quality and sediment/turbidity relationships and effects can be viewed in the Limestone and Pheasant Mountain Opportunity Areas' Environmental Assessment, primarily on pages 35 and 37. That discussion and description of effects is applicable to the Lower Clover analysis because soils, topography, climate, and aquatic/riparian resource conditions are all similar to conditions that exist in the Limestone/Pheasant analysis area. The May/Little River Environmental Assessment

discussed the general effects of timber harvesting, road and skid road construction on storm flow and peak flows for eastern United States conditions (see Appendix E of the May/Little River EA). The background information and analysis included in these documents are being incorporated by reference, and are not repeated here.

The evaluation of herbicide treatment effects on human and aquatic biota was based on risk assessments for the herbicides proposed for possible use, and glyphosate project monitoring results conducted on the Allegheny National Forest in Pennsylvania.

Direct/Indirect Environmental Consequences of the Alternatives

Alternative A – No Action

This alternative would not result in new peak flow, storm flow, flooding, water quality, or human or aquatic biota effects because it would not implement new earth-disturbing or harvesting activities. All current management activities such as routine road and wildlife opening maintenance would continue. Road maintenance may have short term adverse effects by disturbing soils and delivering small amounts of sediment to streams. Wildlife maintenance is not expected to contribute to storm flow, peak flow, flooding, water quality effects or affect human or aquatic biota downstream because little if any soil is disturbed when the grass is cut, and existing, maintained openings in the project area are located well away from streams.

Water quality and riparian and aquatic conditions would remain in their current condition in the short term (see Aquatic effects for description of existing riparian and aquatic conditions). This alternative would not correct the existing road instability and runoff occurring on about 0.3 miles of TR 125; currently, a small section of TR 125 releases sediment to small, non-perennial channels in Compartment 20, stand 14 on the east side of the project area. In the long term, as forests mature and large woody debris increases in streams by natural processes, riparian and aquatic functions and watershed resource conditions will improve.

Alternative B – Proposed Action

Road activities and skid road and log landing development disturb soils. To a limited extent, harvesting trees may disturb small amounts of soil for a short duration. These activities have the potential to affect, indirectly, water quality and stream flow conditions (peak flow and storm flow). Herbicide use has the potential to affect humans, water quality, and aquatic biota indirectly.

The acres in each watershed that would be affected by Alternative B are identified in Table 3-2. Approximately 9.4 percent of the National Forest lands in the project area would be harvested. Overall, Alternative B is expected to have relatively minor water quality and stream flow (storm flow and peak flow) effects because little earth disturbance would occur in any given watershed, and because of the locations of project activities away from most channels and other project design and mitigation measures to be used (see Chapter 2 for these measures). Herbicide use is not expected to adversely affect humans and aquatic biota, or to have any effect on the potential for downstream flooding, for reasons described later in this section.

Table 3-2: Actions proposed under Alternative B, by watershed.

Watershed	Compartment/ Stand(s) Affected	Acres Regenerated and possible herbicide use	Acres Thinned	Acres harvested via helicopter	Acres harvested via skidding	Helicopter landings proposed	Miles Road Affected
Right Fork Clover Run	C 15/ 15, 23, 31, 34 C19/ 3, 8, 9, 54	125	9	109	25	0	2.4 miles FR 767 and FR 767 B improvement
Johnson Run*	C 19/17.1, 17.2	35	0	35	0	0	0
Left Fork Clover Run*	C 19/10, 21 C20/26, 29.2, 29.3, 37, and 57	82	0	75	7	Site e, f, h, i	1.0 miles FR 859 improvement 0.2 temp road to sites h and i; 0.5 mile temp road to stand 17
Clover Run	C 20/16, 17	0	22	0	22	Site c	0.1 mile temp road to site c
Jonathan Run	C 15/59	17	0	17	0	0	0
Upper Jonathan Run	C 15/47, 54, 55	27	78	27	78	Site a, b, d	1.4 miles of FR 767 improvements; 0.2 miles temp road to site b
Brannons Run	C 20/45, 49	17	0	11	6	0	0
Smoky Hollow	C 20/61	12	0	12	0	0	0
Un-named Tributaries to Cheat River	C 20/14.1, 14.2, 14.3, 29.1, 62	65	0	58	7	0	0.5 miles TR 125 new constr. 0.8 miles TR 125 reconstruction 0.4 miles TR 125 abandonment
Total		380	109	344	145	8	0.5 miles construction, 5 miles improvements, 0.8 miles reconstruction, 0.4 miles abandonment, 1 mile temp road

*All figures should be considered approximations. Activities in Johnson Run are within the Left Fork Clover Run watershed.

At a minimum, BMPs would be used in all National Forest timber harvesting unless a more restrictive measure were required by the Forest Plan, or as a mitigation measure in this Environmental Assessment (EA). Examples of more restrictive measures in this EA include helicopter logging in some of the more sensitive harvest areas, Forest Plan filterstrips, and riparian area protection measures which are more restrictive than state BMPs.

Riparian area protection provides stream shading and microclimate protection, habitat for riparian and aquatic species of plants and animals, structural support for streambanks, trees for future sources of large woody debris (LWD), intact root systems to hold soil in place, channel stability and improved streamflow conditions, and other benefits. Riparian protection measures being used in this alternative are site-specific riparian protection measures developed for this project (see Appendix A). These measures provide a greater degree of protection, and potential adverse effects will be less.

Watershed stormflow and peakflow studies referenced in the background document in the Project File were done on entire small watersheds, and generally involved more drastic treatments than those proposed here. Those studies reported effects for the entire watershed, but not effects for further downstream. As described in those studies, notable increases in stormflow parameters were found with the heaviest cuts (clearcuts), which sometimes included herbicide treatments to suppress revegetation in the harvest area. Effects were variable, but generally there were small to moderate but statistically significant increases in stormflows during the growing season. Dormant season effects were generally not significant. And observed stormflow increases usually did not persist for many years after the harvesting, typically 6 years or so, declining as the site revegetated and evapotranspiration was restored. Eastern studies are inconclusive about the stormflow effects of thinning; generally no appreciable effect is seen, although modest stormflow and peakflow increases in the growing season are possible, while dormant season effects are unlikely. Research findings for small watershed response to cutting also included a skid road system, so the combined effect of thinning and skid roads still did not result in substantial storm flow or peak flow increases.

Soil disturbance within the majority of the proposed harvested acres is being largely eliminated by using helicopter yarding. Soil disturbance will be very minor in these harvest units, and helicopter log landings are mostly in existing openings and higher in the watersheds. Few functioning stream channels exist within proposed harvest units, and those that do would have riparian protection. There would be very minor short and long-term sediment and turbidity effects.

Conventional ground-skidding would be for the most part higher in the watersheds, and mostly nearer the ridgetops. About 10% of the acres being conventional logged would be disturbed by skid road construction and use of existing skid roads. For the most part, functioning stream channels have been avoided in harvest unit design and layout, and those that occur would receive filterstrip protection. As identified in Chapter 2, skid roads would be located to minimize soil and filterstrip disturbance, utilize existing old skid routes, and avoid steeper slopes. Much of the terrain to be skidded over is gentle to moderately gentle, although somewhat steeper slopes occur in a few portions. Log landings would be located to avoid stream filterstrips and make use of more gentle terrain. Provided that the conventional harvest units are operated during the normal

operating season (May 1 to November 15), the risk of increased sedimentation in the short and long term would be low and effects would not be significant, because of the harvest unit locations, mitigations employed, timing of harvest activities, and limited occurrence of streams and riparian resources within and adjacent to these proposed harvest units. Conventional harvest activities outside the normal operating season (often called the winter shutdown period) may have a higher risk of erosion and sedimentation effects. Mitigation needed to control adverse effects may include additional stone placement or other improvements to roads and skid roads, a greater level of sale administration and monitoring, timely sale shutdown, and other measures.

Some small stormflow related effects in a small number of non-perennial streams would be possible, but would be very minor and not substantial. The small size and scattered locations of harvest units would help minimize effects, and none of them occupies an entire small watershed as large as those reported on in the referenced research findings. Two-age harvesting removes the majority of the basal area from the site, and this has the potential to temporarily increase stormflow and/or peakflow volumes, although generally not substantially. Thinning harvest removes about a third of the basal area, and this is generally not enough to produce a substantial stormflow response. Riparian tree retention and filterstrip protection would apply along all stream channels, lessening effects and maintaining a portion of the site transpiration capacity.

The majority of the two-age harvesting is by helicopter yarding, so no skid roads would be constructed or used in helicopter units, eliminating any potential for runoff effects from skid roads. Because two-age helicopter harvesting retains a portion of the trees on site, are dispersed among many smaller watersheds, have no skid roads, and no single small watershed would be harvested in an amount greater than 25 acres, no substantial adverse stormflow-related effects are expected. And proposed thinning units are scattered in different subwatersheds as well. There would be no substantial storm flow, peakflow, or flooding effects resulting from any of the harvesting activities.

Conventional ground-skidding in C-15 stands 31 and 34 (25 acres) would have a slightly higher potential for stormflow effects in non-perennial channels because skid roads may contribute to stormflow response. Based on research findings, effects would still be small to moderate, resulting only from the harvested acreage and diminishing in relative magnitude downstream, mostly restricted to growing season stormflows, and declining in magnitude quickly as the site revegetates. These effects would not be significant.

Mitigation measures help reduce the potential for adverse sediment and stormflow effects. Prompt and effective skid road closure, waterbarring, and revegetation by seeding and mulching will help stabilize soil, disperse surface runoff, and reduce the potential for sediment and stormflow effects.

The 78 acre thinning unit (C-15 stand 47) is the largest individual harvest unit within the project area. It would be located on mostly gentle sideslopes south of Upper Jonathan Run, but some moderately steep terrain is within the upper portion of the unit. This unit is well outside the filterstrip and riparian area of Upper Jonathan Run, a perennial stream. This unit is a conventional harvest unit, so skid roads will be constructed and used to yard timber. Some old skid roads from previous logging exist within the unit, and will be re-used, reducing the amount of new skid road construction. Thinning will remove about a

third of the basal area, so the majority of the transpiration capacity of the site will be retained. All filterstrip, riparian area and skid road mitigations will be applied, such as locating skid roads to avoid steep slopes and wet areas. Skid roads will be closed and revegetated. Also, because of its larger size and sideslope location, and with some steeper slopes within the upper part of the unit, this harvest unit should be operated only during the normal operating season. Employing these mitigations will reduce potential sediment and stormflow effects to non-significant levels.

The potential for adverse sediment and stormflow effects downstream from the proposed two-age helicopter harvest area in C-20 stand 61, in the Smokey Hollow watershed, would be reduced because of the small acreage harvested (about 12 acres), which is less than 3% of the approximate 500 acre watershed. There would be no adverse sediment or stormflow effects downstream in the Smokey Hollow watershed. Alternative B would have no adverse effect on the condition of this 303(d) listed stream.

Road construction, reconstruction and abandonment are expected to cause mostly short-term erosion and stream turbidity impacts as road building progresses, and culverts are replaced, added or removed. Road improvement activities would reduce existing long-term sources of soil erosion on FS 767, FS 767B, and FS 859 and may slightly reduce flow-concentration from these roads, reducing the potential storm and peakflow effects. Long-term water quality improvement in reduced sediment delivery and reduced turbidity in streams would be expected from the road improvement work.

Road construction can also have some longer term watershed effects in sediment delivery to streams, and the potential to affect stormflow and peakflow characteristics by intercepting water and increasing the effective drainage network. Longer-term effects would be expected to be minor and not substantial in the Lower Clover area, because of the road locations that are primarily higher in the watersheds and away from streams, and mitigation measures used to control erosion and reduce flow concentration. None of these activities are expected to have any measurable effect on the potential for flooding. And there would be no adverse effects on water chemistry, such as the pH condition of area streams.

Road maintenance, such as grading and ditchline cleaning, during and following timber harvesting activities would be expected to have minor short-term adverse effects in erosion and sediment delivery to streams, but long-term benefits in reducing erosion and sediment coming from existing roads. There is an overall net benefit from maintaining these roads. Road management is another potential source for soil erosion and sedimentation of streams, but regular road maintenance would keep driving surfaces stable and free of ruts, and drainage structures functioning properly. Adverse effects would be minor and not significant.

Access to helicopter landing e, and to the ground-based thinning units in the Clover Run watershed (C-20 stands 16 and 17) is by new and reconstructed road. Portions of this new (0.5 miles) and reconstructed (0.9 miles) road will have some sections of moderately steep road grades, and cross areas of greater sensitivity due to soil wetness and/or low bearing capacity. Road design and resource protection measures would be determined by the resource conditions and site sensitivity identified during field investigation of the road alignment. The more sensitive sections would be constructed to a higher standard, and

may include such mitigation as additional surface stone, culverts and ditches, and rock armoring at culvert outfalls. More routine sections of the alignment would be constructed with less mitigation, but would still be designed to protect soil and water resources. All exposed soil in the reconstructed and new road would be revegetated to stabilize the soil and reduce erosion and the potential for sedimentation.

This road is expected to be used for hauling timber both during and outside the normal operating season. As described earlier, operations outside the normal operating season pose an increased risk of soil damage and sediment runoff. Sale administration should be especially close for activities outside the normal operating season, in order to identify and correct potential problems early. Response to any developing problems may include additional spot stone in the problem areas, other road maintenance such as grading and cleaning drainage structures, and sale shutdown until suitable conditions are obtained.

Road abandonment and restoration would occur on the first 0.4 miles of the old TR125 route in C-20, to close a section of this road that is steep and wet, has inadequate road drainage, is unstable and eroding, causing sedimentation in small stream channels nearby. This activity would have limited short-term effects of soil erosion and the potential for increased sedimentation of two small non-perennial streams, because the restoration work creates some soil disturbance. But long-term reductions in soil erosion and stream sedimentation would result from this road abandonment and restoration, because drainage problems would be corrected, concentrated flow dispersed, exposed soils revegetated, and because road use would be eliminated on this section of TR125. Stormflow effects in these non-perennial streams would be slightly reduced. The abandoned road would quickly stabilize, and long-term benefits would greatly outweigh the small short-term effects. Those short-term effects would be minor and not significant.

There are no known municipal water supply intakes within the area of influence or near the project area. No adverse effects to municipal water supplies, or to other domestic water supplies, will occur. There are no mapped wetlands within the project area that would be affected by any of the proposed activities.

The use of herbicides glyphosate and triclopyr to treat competing vegetation may occur on approximately 23 two-age harvest units (27 stands) on as many as 380 acres. Their use will not impede or delay growth of desired vegetation. Hand application methods will be used, either by backpack sprayer or hatchet and squirt bottle. There would be no herbicide application by broadcast spray methods or mechanized equipment. The selective application of herbicides, as planned in this analysis, have less potential for adverse effects than most of the broadcast treatment studies that have been reported in the forestry research, where small watersheds have been harvested and treated with herbicides to impede regrowth of the forest.

The primary sources of information for assessment of risk to the general public (from accidental exposure in water runoff) and to aquatic organisms from these herbicides are two risk assessments prepared for the Forest Service in 2003 (SERA, March 2003 final reports for glyphosate and triclopyr). For glyphosate, the risk characterization for the general public is clear; there is very little indication of any potential risk at a typical application rate of 2 lbs/acre. There is no route of exposure or exposure scenario suggesting that the general public would be at risk from longer term exposure to

glyphosate. And there are no plausible acute exposure scenarios that exceed a level of concern for the general public at the typical application rate of 2 lbs/acre.

For aquatic organisms the risk assessment for glyphosate supports the conclusion that effects are minimal. The primary hazards to fish appear to be from acute exposures to the more toxic formulations containing surfactants, although at typical application rates (2 lbs/acre) the level of concern for fish species would not be reached or exceeded under worst-case conditions. Still, the use of the more toxic formulations near surface water may raise the concern, and additional mitigation would be prudent. The use of less toxic formulations result in acute risk values that do not approach a level of concern for any species. But when using glyphosate near surface waters where sensitive fish species (ie, trout) may be found, care should be taken to avoid surface water contamination. The likelihood of longer term direct effects on any fish species is extremely remote and unlikely, and the likelihood of direct acute toxic effects on aquatic invertebrates is likewise remote.

For triclopyr, the risk characterization for accidental/incidental exposure to humans is similar. Under normal circumstances, members of the general public should not be exposed to substantial levels of triclopyr as a result of Forest Service activities. At the typical application rate of 1 lb/acre, under the foreseeable conditions of exposure there would be no route of exposure or exposure scenario suggesting that the general public would be at risk from longer term exposure to triclopyr. None of the longer term exposure scenarios exceed a level of concern. Some acute exposure scenarios can lead to exposures that are above the level of concern for humans, but most of them involve direct spray of the human body, and occur at an upper range of exposure. They are not for off-site exposure to water. Because of the planned method of application and many other safeguards, such a scenario for the general public would not exist in the Lower Clover project. And in the runoff to a small stream scenario, even at an unusually high rate of application (exceeding the typical application rate by a factor of 10), the level of concern would not be exceeded. While care is needed in making triclopyr applications to minimize the risk of accidental exposure to the general public, the risks in the Lower Clover project area are extremely small.

For aquatic organisms, the risk from triclopyr differs by formulation. For triclopyr TEA (triethylamine salt), at an application rate of 1 lb/acre, acute and chronic risks to aquatic animals, fish, invertebrates and plants from runoff into streams are very low. Although triclopyr BEE (butoxyethyl ester) is much more toxic to aquatic organisms than the TEA formulation or the triclopyr acid, the projected levels of exposure are much less even for acute scenarios. This is due to both the rapid hydrolysis of BEE to triclopyr acid, and to the lesser runoff of BEE because of its lower water solubility and higher affinity for soils. Despite this, triclopyr BEE is projected to have a somewhat higher risk when used near bodies of water, highlighting the need for greater caution when applying triclopyr BEE in areas where runoff to streams could occur.

While the risk assessment for triclopyr indicates limited concern for potential water effects, mostly at higher rates of application and with the BEE formulation, the expected level of effects is very low. The exposure scenarios used in the risk assessment are for the most part highly conservative, and over-estimate the actual level of exposures that might more reasonably be expected. Also, herbicide rates of application expected to be

used in the Lower Clover project are well below the higher rates included in the risk assessment, and are at the lower end of the typical application rates.

The risk assessments for glyphosate and triclopyr, therefore, clearly indicate the very low level of risk to the general public and to aquatic organisms from their use in forestry applications. And because of project design aspects and mitigation measures planned for use in the Lower Clover project area, the potential for adverse effects is further reduced.

Runoff and leaching of triclopyr to surface and groundwaters has not been a problem. In a West Virginia study, triclopyr was applied at a rate of 10 lb/acre to a small watershed by aerial application. Peak streamflow concentrations were only 0.08 parts per million (ppm) (McKellar and others, 1982). In a study on the coastal plain flatwoods of Florida, triclopyr was applied to small watersheds in both the amine (1.8 lb/acre) and ester (1.4 lb/acre) formulations. Buffers of only 16 feet were left along ephemeral stream channels. Monitoring of streamflow and 14 shallow ground water wells for five months following applications did not detect any residues of triclopyr (Neary and others, 1987).

More recently, monitoring of glyphosate applications has been conducted on the Allegheny National Forest in northwest Pennsylvania, in streams near areas of treatment to utility rights-of-way, in 1999 and 2000 (Norris, 2002). The monitoring resulted in virtually all stream samples having glyphosate concentrations that were below the ability of the analysis method to detect it (the detection limit), which was 0.01 milligrams per liter (mg/l). No sample reached the detection limit, including the samples taken in conjunction with rain events. This was for treatment areas using small to modest buffer strips of 10 to 38 feet. The results were considered to show that glyphosate movement to nearby streams was controlled, despite limited buffer strip widths, and that water quality was protected.

In another, unpublished (USDA-FS 2002) study done on the Allegheny National Forest in 2002, a 15 acre harvested area was broadcast sprayed with a glyphosate/surfactant mixture using a mechanical sprayer. The treated area was in close proximity to a perennial, fish-bearing stream. The untreated buffer between the site and live water in the stream was 75 feet. Results of this monitoring were similar to the monitoring done in 1999-2000. All samples collected reported concentrations of glyphosate below the detection limit, which was 0.0005 mg/l. Glyphosate was undetected, and therefore the water quality protection criteria established for the project (0.7 mg/l) was protected. The conclusion was that human health and aquatic life were more than protected in this application of glyphosate, and that the buffer strip had been effective in protecting water quality.

The above information and results of monitoring documents that the planned use of these two herbicides is safe to water quality, the general public and to aquatic biota when they are applied according to label directions, applicable laws and regulations are followed, and with mitigation measures (such as restrictions on application during wet weather) used for the protection of water and the aquatic community. For a number of reasons, herbicide use in the Lower Clover project area would be expected to have a very low potential for adverse effects to water quality, the general public and aquatic organisms, as compared to what is described in the two risk assessments, discussed above. The reasons for this are:

- The planned application rates in the Lower Clover project area are at the low end of the range of rates of application that are used: 1.0 lb/acre glyphosate, and 0.5 lb/acre triclopyr. Such low rates of application would keep quantities used low, and further reduce the potential for off-site movement in runoff.
- Only hand methods of application would be used, described earlier. This helps insure that the applications will be target-specific, limit the area actually treated and quantities used, and reduce the potential for overspray.
- Riparian areas (Appendix A) and filterstrips (Forest Plan herbicide standards) would not receive herbicide treatment. "No Programmed Harvest" areas along all perennial, intermittent and ephemeral stream channels would not be treated. Also, herbicide applications would not be closer than 50 feet to any area of free or flowing surface water (100 feet where slopes exceed 30 percent).
- Most of the proposed harvest areas, and therefore potential herbicide treatment areas, have been designed to avoid the larger stream channels, and many of the smaller non-perennial streams as well. Very few non-perennial streams, and no ponds, would be close to possible herbicide treatment areas.

The use of herbicides planned in Lower Clover would have far less potential for effects to water quality than herbicide studies reported in forestry research findings. As long as all restrictions on use and mitigations are followed, no substantial off-site adverse effects in streams or groundwater are expected. No substantial adverse effects to the aquatic community would occur, and would likely not be measurable. And the potential for adverse effects to nearby residents and the downstream public would be negligible. There would be almost no effect on storm flows and peak flows because of the selective application methods, small proportions of watersheds treated, dispersed areas of treatment, and other mitigation measures being used. There would be no effect on downstream flooding from use of herbicides in Lower Clover

In Alternative B, overall effects within the entire project area, for all sub-watersheds, are expected to be minor and largely short-term. While 489 acres of harvesting is proposed in Alternative B, about 70% of it is by helicopter yarding. Helicopter yarding ensures that no road construction or skid roads will be constructed within those units, protecting slopes, coves and functioning channels from earth disturbing activities. Helicopter landings are located mostly away from streams, utilize existing openings when possible, and protect filterstrips. Harvest units are mostly small and scattered. Portions of many units are located along or near ridgetops, or occupy moderate to gentle terrain. Nearly all of the steeper harvested terrain will be by helicopter yarding.

All these project design features and mitigation measures will reduce the potential for adverse effects. The risk of increased sedimentation in the short and long term is low and not significant, because of the mitigation and logging systems being used, harvest unit and landing locations, silvicultural prescriptions, and the limited presence of aquatic and riparian resources within the proposed harvest units. Stormflow and peakflow related adverse effects are expected to be minor and relatively short-term, and not significant. Although small increases in stormflow during the growing season are possible in some

cases and in the immediate vicinity of the harvesting, no significant adverse effects are expected, and any such increases would be quickly attenuated in the downstream channel system. There would be no substantial or measurable effect on downstream flooding. No significant adverse effects from any of these activities are expected in the Cheat River, and would not likely be measurable. Water quality and designated uses in all streams would be maintained and protected.

Alternative C

Alternative C differs noticeably from Alternative B in that there would be no regeneration harvests; less than 42 percent of the volume of timber would be harvested, and no herbicide would be used. Because all proposed harvesting (469 acres) would be thinning, fewer total acres would be harvested, and most yarding would be by helicopter (345 acres), the potential for adverse effects to water quality and streamflow (storm flow and peak flow) would be less than Alternative B. No herbicide would be applied, so there would be no herbicide related effects to the general public or aquatic biota.

The acres in each watershed that would be affected by Alternative C are identified in Table 3-3. Approximately 9 percent of the National Forest lands in the project area would be harvested. Overall, Alternative C is expected to have minor water quality and stream flow (storm flow and peak flow) effects because little earth disturbing activities and no herbicide use would occur in any given watershed.

As Table 3-3 indicates, Alternative C would harvest 47 fewer acres in the Right Fork watershed, 15 fewer in the watersheds of un-named tributaries to Cheat River, and 1 acre less in the Johnson Run watershed. About 53 more acres would be harvested in the Left Fork watershed than Alternative B. No acres would be harvested in the Smoky Hollow watershed. All others would be the same.

Potential helicopter landing sites and road activities would be the same as Alternative B, and their effects in each watershed would be the same.

In Alternative C, overall effects within the entire project area are expected to be minor and largely short-term. Fewer acres would be harvested, all of it by thinning, and the majority of that (74%) would be by helicopter yarding. The risk of increased sedimentation in the short and long-term is low and not significant. Stormflow and peakflow related effects, if at all, are expected to be very minor and short-term, and would be quickly attenuated in the downstream channel system. None of these effects would be significant in any of the project area watersheds, and effects in the Cheat River would not likely be measurable. There would be no substantial or measurable effect on downstream flooding. Water quality and designated uses in all streams would be maintained and protected.

Cumulative Effects

Alternative A – No Action

Alternative A would not implement new earth disturbing activities that would either reduce or contribute additional water quality or stream flow effects. Thus, it would not add to the cumulative effects of the past, present, and reasonably foreseeable future actions listed at the beginning of Chapter 3. It would not authorize the use of herbicides that would add to past, present, or future effects to humans and aquatic biota.

Table 3-3. Actions proposed under Alternative C, by watershed.

Watershed	Compartment/ Stand(s) Affected	Acres Regenerated and possible herbicide use	Acres Thinned	Acres harvested via helicopter	Acres harvested via skidding	Helicopter landings proposed	Miles Road Affected
Right Fork Clover Run	C 15/ 15, 23, 34 C 19/ 9	0	87	76	11	0	2.4 miles FR 767 and FR 767 B improvement
Johnson Run*	C 19/17.1, 17.2	0	36	36	0	0	0
Left Fork Clover Run*	C 19/10.1, 10.2, 21 C20/26, 37, and 57	0	135	128	7	Site e, f, h, i	1.0 miles FR 859 improvement 0.2 temporary road to sites h, i 0.5 mile temp road to stand 17
Clover Run	C 20/16, 17	0	22	0	22	Site c	0.1 mile temp road to site c
Jonathan Run	C 15/59	0	17	17	0	0	0
Upper Jonathan Run	C 15/47, 54, 55	0	105	27	78	Site a, b, d	1.4 miles FR 767 improvements 0.2 mile temp road to site b
Brannons Run	C 20/45, 49	0	17	11	6	0	0
Smoky Hollow	0	0	0	0	0	0	0
Un-named Tributaries to Cheat River	C 20/14.1, 14.2, 14.4, 62	0	50	50	0	0	0.5 miles TR 125 new constr. 0.8 miles TR 125 reconstruction 0.3 miles TR 125 abandonment
Total		0	469	345	124	8	0.5 miles construction, 0.8 mile reconstruction, 5 miles improvement, 0.4 miles abandonment, 1 mile temp road

*Activities in Johnson Run are within the Left Fork Clover Run watershed.

Alternative B

The Clover Run watershed consists of approximately 19,000 acres. Several additional thousands of acres occur within the Jonathan Run, Upper Jonathan Run, Smokey Hollow and Cheat River Direct Drains watersheds that are within the analysis area for cumulative effects. A relatively small portion of this acreage (less than 25%) is National Forest lands in the Lower Clover project area, although considerably more National Forest acreage occurs in the upper portion of the Clover Run watershed. The remainder is non-federal land. Activities on federal land are fairly well documented, but some of the activities on non-federal land are less well known.

As noted at the beginning of Chapter 3, mineral, residential, and road developments have occurred in the past, and are expected to continue in the area. Aerial photography and other records confirm that federal and non-federal lands have been timber harvested in the past to recent past, and some harvesting activity on federal land is occurring now. Timber harvesting has occurred very recently on private lands, and may be occurring now but this is unknown. Such harvesting has usually been conducted via conventional logging methods and skid roads have been created. However, helicopters have been used to remove trees from some federal lands in recent years. Limited herbicide use has occurred in the past on federal and private lands, and may continue to be used in these watersheds. More of the watershed is likely be harvested in the future, but only those harvesting activities identified at the beginning of Chapter 3 are known at this time. All these activities have had some short and long-term effects on streams in terms of sedimentation and stormflow conditions.

Private land agriculture, grazing and roads have substantial sediment effects in some parts of the watersheds. The State road system is a substantial source of stream sediment and results in substantial turbidity during periods of storm runoff, and may also influence stormflow and peakflows in some storm events.

Currently, much of the federal and non-federal lands are forested, usually containing stands over 60+ years old. Activities that contribute to cumulative effects and that affect watershed conditions are described in the Hydrology report in the project file. The Left and Right Forks of Clover Run in particular receive a chronic and substantial supply of sediment from these and other widespread and varied human-caused sources, as well as natural sources of watershed and stream bank erosion. Floods contribute large quantities of sediment from upland sources, such as roads, to these and other streams. Some of this is a natural watershed process, but it is likely that the cumulative effect of all land uses and activities within the watersheds have contributed to storm flow and possibly some peak flow increases, particularly for the more routine storm events and in the growing season. The magnitude of the cumulative storm flow effect is not possible to say, but could be more substantial for non-flood producing storms.

Some of these related effects are closely tied in with the condition of riparian areas, and large woody debris effects in streams (see Aquatic effects). Since most of these streams are somewhat modified systems, and many are largely lacking in large woody debris and other stream roughness features, and with simplified structure, storm flow energy is greater and channel damage is likely to be greater. Greater amounts of channel sediment and bed load are sometimes moved in larger storms and floods as a result.

Based on field observations of past National Forest timber harvesting and road building activities within the Lower Clover Opportunity Area and the cumulative effects watersheds, and on the information gathered for this analysis, water quality and aquatic resources would be maintained

and protected in implementation of Alternative B. Substantial adverse effects of Lower Clover proposed activities would be mitigated by measures identified in Chapter 2. Water quality effects are expected to be minor; sediment delivered to streams is expected to be minor and mostly short-term because of the project design and mitigation applied. Stormflow and peak flow adverse effects are expected to be minor and relatively short-term. Small and possibly measurable increases in storm flow, and possibly peak flows, may occur in the vicinity of some harvest units during the growing season, but they are expected to be of short duration and not substantial, and would have almost no effect further downstream.

Despite the varied sources and cumulative sediment effects in the Left and Right Forks of Clover Run watershed, these streams and all their tributaries are considered by the State of West Virginia to be meeting all required water quality criteria and their designated uses. None of them are listed in the 2002 State 303(d) impaired streams list. And despite the cumulative sediment impacts to these streams from the numerous causes and sources discussed above, the additional increment of sediment impact from the activities proposed in Alternative B is expected to be very small, and would not contribute to cumulatively significant effects in these streams.

Smoky Hollow is presently included in the 303(d) impaired streams list, as discussed above, but for unspecified sources of impairment. The future Corridor H construction would likely add a significant additional burden in Smoky Hollow, primarily sediment, and possibly from road runoff chemicals such as de-icing substances. But the proposed single harvest unit within the watershed of Smoky Hollow in Alternative B would have no substantial additional increment of effect. This is because of the small unit size, location at the top of the watershed, use of helicopter yarding, and other mitigations employed. The effects of this harvest unit in Smoky Hollow are not likely to be measurable. And any minor effects that might occur would likely have diminished by the time Corridor H construction begins.

Combining the effects of the Alternative B proposed projects with past and present actions and foreseeable future actions, both on federal and non-federal lands, there would be no cumulatively substantial, adverse effect on water quality, stormflows or peak flows. There would be no significant adverse effects to water quality, the aquatic community, or to human health and aquatic biota from herbicide applications. Beyond the project area boundaries, downstream effects from these activities on National Forest lands are expected to be insignificant. It is not likely that sediment or stormflow effects would be observable in the Cheat River. There would be no cumulatively significant effect on any downstream flooding. No significant adverse effects on water quality or the designated use of Clover Run, Smoky Hollow or any other project area streams would occur.

Alternative C

The rationale for, and discussion of cumulative watershed activities and effects used in Alternative B is applicable to analysis of cumulative effects in Alternative C.

Under Alternative C, the potential for adverse effects to water quality, sediment and storm flow is slightly to moderately less than in Alternative B, for the reasons discussed in the description of direct and indirect effects. Because the overall effects of the alternative are less, the cumulative effects of Alternative C are nearly the same or slightly less than Alternative B.

Sedimentation effects from some of these activities, particularly the road construction and reconstruction projects and some of the ground-skidding, could be detectable in streams, mostly

during the period of the active harvesting and for moderate size storm events. But those effects would be small, mostly short-term, and water quality would be maintained..

No herbicide would be used that would contribute to the effects of past, present, and future effects to humans and aquatic biota.

Combining Alternative C projects with past and present actions and reasonably foreseeable future actions, both on federal and non-federal lands, there would be no significant cumulative effect on water quality or stormflows and peak flows. Beyond the project area boundaries, downstream effects from these activities on National Forest lands are expected to be insignificant. It is not likely that sediment or stormflow effects would be observable in the Cheat River. There would be no cumulatively significant effect on any downstream flooding. No significant adverse effects on water quality or the designated use of Clover Run or any other project area streams would occur.

Forest Plan Consistency

All alternatives would be consistent with the Forest Plan, including Forest-wide standards and guidelines for soil and water management (Forest Plan, pp. 79-82), Appendix R for riparian area and filterstrip management, and Management Prescription 3.0 standards (pp. 137-138). The riparian management guidelines being used in the Lower Clover analysis are site specific measures to further mitigate adverse effects.

Biological Resources

Aquatic Resources

Resource Impacts Addressed

This section discloses the effects alternatives may have on riparian and aquatic habitat quality (sediment levels and stream stability and complexity); aquatic habitat connectivity and migration; aquatic threatened, endangered, and sensitive species; and occurrence and productivity of aquatic species, such as trout. It answers the public's questions regarding mitigation that would be used to protect riparian areas and streams. Other issues related to aquatic biota and stream habitats are addressed in the Watershed effects.

Affected Environment

Existing soil conditions, which affect aquatic resources, are described in the Soils effects. The watersheds potentially affected by proposed activities are identified later in Tables 3-4 and 3-5. Water quality in the project area streams is moderate to good, except that suspended sediment and turbidity may be high in some streams during storm runoff events. Otherwise, streams generally run clear. Stream water chemistry is generally meeting State water quality standards, but productivity is moderate to low.

Overall, riparian and aquatic habitat and trout productivity in the Lower Clover project area are considered to be impaired. This area's impaired condition is due to impacts associated with logging prior to Federal ownership in the early 1900's, timber harvesting activities on Federal and non-federal lands since the 1950s, and other more recent land uses (06/29/04 Aquatic Resources Report). Past activities identified at the beginning of Chapter 3 have contributed to the following conditions in area streams:

- Elevated levels of fine sediment. Soil disturbed by past and present activities has entered streams and impaired the quality of stream substrates, reducing oxygen levels needed by aquatic organisms such as developing fish embryos;
- Barriers to aquatic migration. Some road culverts installed in the area act as barriers to species migrating within project area streams, which isolates various stream reaches and disrupts life history patterns for various aquatic organisms.
- Unstable channels and simplistic in-stream habitat conditions. Past earth disturbance and removal of rocks and trees from stream beds and banks adversely affected stream channels and reduced the availability of large woody debris. More large woody debris is needed in area streams to help dissipate stream energy and provide structure for channel stability and aquatic habitat (e.g. pools and cover)(06/29/2004 Fisheries/Aquatic Biota Resources Report); and
- A high degree of vulnerability to elevated stream temperatures. Riparian areas along most of the smaller streams in the area are well forested; but past road activities and harvesting in riparian areas of larger streams have left riparian vegetation and stream shading impaired. This is especially true where State roads occupy riparian areas and closely follow streams. This reduction in stream shading contributes to high summer and early fall low-flow stream temperatures, which can affect aquatic species occurrence.

Existing Forest activities that may impact the above conditions are maintenance of roads and wildlife openings. During road maintenance, soil is disturbed and short term surges of sediment likely enter road ditches and flow into streams. Maintenance of wildlife openings may have some affect, but they are mostly located away from streams; their maintenance likely has little, if any, impact on riparian and stream conditions.

A number of native fish (primarily non-game species) and introduced fish species inhabit streams in the project area (6/29/04 Aquatic Resource Report). As noted in the Threatened and Endangered Species effects, aquatic threatened and endangered species are not known to occur in the project area or the watershed. Regional Forester's Sensitive Species are not known to occur in the project area either, but the Pearl dace has been documented in the Clover Run watershed, upstream from the project area. Surveys conducted in Clover Run, Left and Right Forks Clover Run, Mill Run, and Laurel Run, indicate native brook trout and stocked trout, small mouth and rock bass, stoneroller, suckers, chubs, shiners, several dace species and mottled sculpin exist within the Clover Run watershed (Surveys 1978, Sampling 2004). Surveys in Upper Jonathan Run, Hobson Run, Indian Run, and Johnson Run documented the presence of native brook trout (Surveys 1990s, Sampling 2004). Native brook trout have also been observed in some of the smaller un-named streams within these watersheds.

Many of the species in the project area (e.g. bass, sunfish, suckers, and minnows) are associated with warm to cool water habitats and primarily occur within the Cheat River or in the lower reaches of the larger tributaries like Clover Run. Other species (*e.g.* trout and dace) have a lower tolerance for warmer stream temperatures and are typically found in the smaller, coldwater streams within the project area. Brook trout prefer streams with cold, clean water, a 1:1 pool to riffle ratio and abundant cover (USFWS 1982).

Annual and seasonal variations in stream temperature can allow for shifts in species occurrence. As such, coldwater fish species may be found in the lower reaches of the larger tributaries during the cooler, wetter periods, yet retreat to coldwater areas toward the headwaters with the onset of

warmer, summer base flow conditions. On the other hand, warm water species may expand their range toward the headwaters during warmer, summer base flow conditions.

Wild trout (brook trout, rainbow trout, and brown trout) are identified in the Forest Plan as management indicator species (MIS). The objective for MIS is to maintain or improve their habitat. As previously mentioned, trout productivity is limited by elevated levels of fine sediment, reduced riparian vegetation, and a lack of large woody debris, all of which affect the quality of their pool habitat and hiding cover. Despite these degraded habitat conditions, reproducing native brook trout are known to occur in some of the area's perennial streams. Brown trout and rainbow trout are also known to occur, but it is not known if these introduced species are reproducing and establishing wild populations.

Scope of the Analysis

The area of analysis for direct and indirect effects includes the sub-watersheds affected by proposed activities (see Tables 3-4 and 3-5). The area of analysis for cumulative effects includes the entire Clover Run watershed, Jonathan Run, Upper Jonathan Run and Smokey Hollow watersheds, Brannons Run, and the Direct Drains to the Cheat River within the project boundary. No substantial or measurable effect on aquatic populations or habitats from project activities is expected to extend further downstream than the limits of the project area, even though these streams are tributary to the Cheat River just to the east. This is because of the limited area of proposed activities, mitigation of adverse effects designed into the projects, and the relative size of the Cheat River in relation to the size of the project area and proposed activity acres.

Methodology

Sediment effects were assessed by evaluating the potential acres and miles of ground disturbing activities within a sub-watershed that may increase sediment levels; the location of the disturbance relative to the channel network; and the potential to reduce sediment levels by correcting existing sediment sources. Ground disturbance associated with timber management is generally related to the logging method and transportation system (Aquatic Resource Report). Development and maintenance of haul roads and skid roads are expected to be the greatest source of sediment during harvest activities.

The potential to affect aquatic species migration was assessed by the number and locations of skid road and road stream crossings. To address effects to stream shading, the alternatives were evaluated based on the number and size of trees that might be removed within the riparian area.

To address large woody debris, the alternatives were analyzed for their potential to impact tree recruitment to streams. Large woody debris (trees and tree limbs) fall into stream channels as timber stands along stream channels mature and trees die or succumb to wind throw and fall over. The amount of large woody debris that may fall into a stream can be reduced by harvest activities along channels that reduce the size and number of trees within the riparian stand. It was assumed that large woody debris comes from adjacent timber stands within 100 feet of the channel, and harvesting within this area reduces the recruitment potential.

The effects to aquatic species were determined based on their presence or absence in the project area, and the effects to the above factors.

Direct/Indirect Environmental Consequences

Alternative A – No Action

No new Federal actions would be implemented. Natural processes would continue. Current management such as maintenance of roads and wildlife openings would continue.

In the short term, existing aquatic conditions would likely persist (see Affected Environment). In the long term, road maintenance would help reduce the extent to which roads contribute to stream sediment production. Over time, as trees in riparian areas mature, more of them are expected to provide stream shade, or to die, fall into the streams, and serve as large woody debris. Increased stream shading would reduce streams' vulnerability to elevated stream temperatures. Increased large woody debris would help improve sediment storage; it would also help improve stream stability and increase aquatic habitat complexity (more pools and hiding cover). Migration barriers would continue to exist over time unless action is taken to correct them.

No Federally listed or proposed aquatic species are known to occur in the project area. Alternative A is not expected to impact population viablity for Regional Forester's Sensitive Species or other aquatic species in the short term because habitat conditions are not expected to change. Aquatic species could benefit from Alternative A in the long term if fine sediment levels in stream substrates decline, stream shading increases to create additional miles of cool water, and stream stability and habitat complexity improve.

Environmental Consequences Common to All Action Alternatives

Alternative B and C would result in the same road-related effects because they both would complete the same type and amount of road work and in the same locations. Overall, the road-related effects to all sub-watersheds in the project area are expected to be minor and largely short-term, as explained below and in the Watershed effects.

Alternative B and C are expected to directly affect aquatic resources when roads are constructed across stream channels and when culverts are installed in or removed from streams during road construction, reconstruction, and abandonment. Indirect effects could occur if rain washes disturbed soils off roads into stream channels. Also, roads may affect stream flows by altering watershed hydrologic processes. They could function as an extension to the stream network by intercepting soil water and groundwater at road cuts, and routing that water and surface runoff to streams. Such effects tend to make streams more susceptible to runoff events which can change the storm runoff hydrograph, and sometimes alter stream base flow conditions as well (see Watershed effects). Altering the hydrograph of streams in this way can impair aquatic habitat by changing the distribution and stability of in-stream flows, creating harsher conditions for aquatic biota.

Under both action alternatives, proposed road construction and reconstruction of TR 125 could affect about six acres. These activities would likely result in some soil erosion and potential sedimentation effects to a small number of non-perennial, streams that drain directly to the Cheat River (Watershed effects). Road abandonment and restoration on TR 125 would be expected to reduce long-term erosion and sedimentation effects, affecting about one acre of soil and improving watershed conditions of two small drainages to the Cheat River. Short lengths of temporary road would be constructed in several watersheds, disturbing about two acres. Their construction could result in short term soil erosion and sediment effects. However, little to no

long term effects would be expected from their construction because they would be closed and restored at the end of their brief use.

Proposed roads would have limited riparian area occupancy, so it is unlikely they would result in new adverse effects of any consequence to riparian areas. Alternative B and C's effects to stream shade and potential large woody debris recruitment would be limited. Roads proposed for construction and reconstruction would have limited direct occupancy within the riparian areas of several small non-perennial channels. Proposed road abandonment and restoration activities would remove a section of TR 125 that presently occurs in the riparian area of two small non-perennial channels; rehabilitating this section is expected to result in improved riparian conditions over time.

In summary, stream sedimentation from road activities would likely be short term and of little consequence because of the relatively limited nature and amounts of road activities proposed (nine acres); the location of roads away from stream channels, for the most part; and because of the planned measures for road work, which are expected to help protect all functioning channels and limit riparian tree removal to essential road crossings of streams (Appendix A). Riparian area effects are also expected to be minor. Stream shade and the long-term potential for trees to fall into streams and improve channel stability and aquatic habitat would be protected and maintained. Effects to aquatic habitat connectivity and migration would not be expected.

Road activities for Alternatives B and C are not expected to affect aquatic species occurrence. This is because road-related activities are not likely to substantially increase adverse effects to aquatic habitats. As described above, sediment and riparian effects of roads activities are expected to be limited and short-lived. Because of this, the aquatic community of fish and other biota would be protected, with no substantial adverse effects in terms of populations' distribution or viability. There would be no significant adverse effects to the viability of wild trout populations.

Alternative B – Proposed Action

The overall effects of Alternative B on aquatic habitats and species populations in the project area are expected to be minor and largely short-term. This is because most harvest units, roads, and log landings would be developed well away from the main stream channels. It is also because little soil would be disturbed in the project area. The effects of road activities were previously described under "Environmental Consequences Common to All Action Alternatives." The effects of developing skid roads, harvesting timber, developing landings, and using herbicides are described below.

Skid road development and timber harvesting have the potential to directly affect aquatic resources if skid roads created in units proposed for conventional ground-skidding are constructed across stream channels and if trees are removed from riparian areas. Development of skid roads, harvesting timber, and use of log landings are likely to indirectly affect aquatic resources because these activities have the potential to change runoff patterns, increase erosion rates, and may impact riparian characteristics. The following table summarizes the acres of harvesting and direct soil disturbance from development of skid roads and log landings within each sub-watershed for Alternative B.

Table 3-4. Acres of watershed occupancy and disturbance by harvest activity for sub-watersheds in the Lower Clover project area, Alternative B. (This doesn't include roads; see "Environmental Consequences of All Action Alternatives." All figures are approximations.)

Watershed Name	Watershed Acres	Acres Proposed for Harvest	% of Watershed Harvested	Skid road Disturbance Acres (10%)	Possible Landing Disturbance Acres	% of Watershed w/Soil Disturbed
Right Fork Clover	4,900	134	< 3%	2.5	1	< 0.1%
Left Fork Clover	13,400	117	< 1%	0.7	5	< 0.05%
Johnson Run	352	35	10%	0	1	< 0.3%
Clover Run*	19,000	273*	< 2%	5.4*	10*	< 0.1%
Jonathan Run	1,018	17	< 2%	0	0	0
Upper Jonathan Run	1,011	105	10%	7.8	3	1%
Brannons Run	211	17	8%	0.6	0	< 0.3%
Smoky Hollow	500	12	< 3%	0	0	0
Cheat River Direct Drains	> 500,000	65	< 0.02%	0.7	0	< .01%
Total				14.5*	13*	

*Clover Run figures are for the entire Clover Run watershed; they include acres disturbed in tributaries such as the Right Fork and Left Fork Clover and Johnson Run.

The above table displays the extremely limited nature of soil disturbance created by proposed activities in each of the sub-watersheds within the project area. Upper Jonathan Run would receive the maximum soil disturbance (about 1%). About 0.3% of the soils in the Brannons Run and Johnson Run sub-watersheds would be disturbed. The rest of Lower Clover's sub-watersheds would have between 0 and 0.1% soil disturbance.

Alternative B was designed to minimize the potential for runoff and erosion by having most acres harvested via helicopters and purposefully proposing landing sites that would avoid sediment and riparian area effects. An extremely small proportion of the project area would receive concentrated soil disturbance. About 15 acres of soil would be disturbed by skid road development (in conventional harvest units). About 13 acres would be disturbed by log landing creation (conventional, helicopter, and service and emergency landings). Combined with the 9 acres of soil disturbance that may be caused by proposed road work, about 37 acres of concentrated soil disturbance may occur within the project area. This would constitute approximately 0.7% of the 5226 acres of National Forest System lands in the project area, or about 0.4% of the 9165 acres in the project area.

Helicopter logging itself is not expected to contribute in any substantial way to existing sediment levels. Log landing development is not expected to noticeably contribute sediment to streams or affect riparian habitat because little acreage of soil would be disturbed in a given sub-watershed. Many of the areas proposed for use as landings have been used as conventional log landings in the past; they have fairly level ground, and some already have a rock base. Most landings are proposed for locations on or near ridge tops, away from stream habitat. The few landings proposed near streams (such as proposed landings "c" "h", and "i") are on level ground, and few,

if any, trees would be harvested within 100 feet of the stream courses. Thus, their effects to sediment levels, stream shading, and large woody debris would be limited (see Soil effects).

Timber harvesting and skid road and landing developments are expected to pose little risks to riparian characteristics within or adjacent to harvest units. Riparian timber stands along functioning stream channels would be protected via protection strips (Appendix A). No programmed harvesting would occur in these areas. This would ensure trees are maintained to fulfill important ecological functions for the stream environment like providing stream shading and large woody debris for stream channel stability and aquatic habitat development and maintenance.

Timber harvesting and log landing development are not expected to affect the aquatic habitat connectivity or migration of aquatic species, since these activities would not occur within streams and would have little impact on riparian habitat due to riparian protection strips. Skid roads are not expected to cross fish-bearing streams, so they would not be expected to affect aquatic habitat connectivity or migration.

Alternative B is not expected to adversely affect aquatic species occurrence. This is because sediment and riparian effects from timber harvesting and skid road and log landing developement are expected to be limited and short-lived.

Reproduction and productivity of trout and other aquatic biota are not expected to be noticeably affected. Alternative B is not expected to have a measurable effect on fine sediment in the spawning gravels of fish bearing streams; as mentioned before, little soil disturbance is anticipated in an given subwatershed--less than about 0.7% of the project area would be disturbed. Also, activities have been designed to avoid adverse effects, or measures has been identified to reduce effects (Appendix A). The aquatic community of fish and other biota would be protected, with no substantial adverse effects in terms of population viability or distribution.

Herbicide treatments proposed in some regeneration units pose little, if any, risk to aquatic resources. Herbicides use would not disturb soils that would contribute to sediment effects. Herbicides would kill small vegetation within two-age regeneration units; but it would not kill larger trees or be used within streamside buffer strips. Thus, it would not affect riparian habitat or the potential for large woody debris recruitment. Herbicide use would not affect aquatic migration. The use of herbicides represents a risk to water quality or reproduction and productivity of aquatic species if an accidental spill occurs (see Watershed effects); but this risk would be minimized by following the proper handling procedures, application rates, and using it away from channels.

Alternative C

The potential for Alternative C to result in adverse sediment and riparian resource effects would be similar, but less than for Alternative B. This is because Alternative C would disturbe fewer soils and would only thin units, not regenerate them. It would harvest 21 fewer acres, remove 42% less volume, and would harvest more stands using helicopters.

Alternative C activities would be implemented within the same watersheds as in Alternative B, although in somewhat different amounts; and, there would be no harvesting in the Smokey Hollow watershed. The following table summarizes the acres of harvesting and direct soil disturbance within each sub-watershed under Alternative C.

Table 3-5. Acres of watershed occupancy and disturbance by harvest activity for sub-watersheds in the Lower Clover project area, Alternative C. (This does not include truck roads. All figures are approximations.)

Watershed Name	Watershed Acres	Acres Proposed for Harvest	% of Watershed Harvested	Skid road Disturbance Acres (10%)	Possible Landing Disturbance Acres	% of Watershed w/Soil Disturbed
Right Fork Clover	4,900	87	< 2%	1.1	1	< 0.05%
Left Fork Clover	13,400	170	< 2%	0.7	5	< 0.05%
Johnson Run	352	35	10%	0	1	< 0.3%
Clover Run*	19,000	279	< 2%	4.0	10	< 0.1%
Jonathan Run	1,018	17	< 2%	0	0	0
Upper Jonathan Run	1,011	105	10.4%	7.8	3	1%
Brannons Run	211	17	8%	0.6	0	< 0.3%
Smoky Hollow	500	0	0	0	0	0
Cheat River Direct Drains	> 500,000	50	0.01%	0	0	0
Total				12.4*	13	

*Clover Run figures are for the entire Clover Run watershed; they include acres disturbed in tributaries such as the Right Fork and Left Fork Clover and Johnson Run.

As the table indicates, Alternative C would result in little soil disturbance. About 12 acres of soil would be disturbed by skid road development. About 13 acres would be disturbed by the development of landings. This would result in about 34 acres of concentrated soil disturbance within 5226 acres of National Forest System lands of the 9165 acre project area. This, in combination with about 9 acres of soil disturbance from proposed road work, would result in 34 acres (about 0.7%) disturbed in the project area and about 0.4% disturbed in the watershed. The maximum disturbance that would occur in a sub-watershed would be about 1% in Upper Jonathan Run. Less than 0.3% would be disturbed in Brannons Run and Johnson Run, and between 0 to 0.1% in the remaining watersheds.

Minor sedimentation effects may result from the above mentioned soil disturbance, but adverse effects would be small and largely short-term. Potential adverse effects to riparian resources from timber harvesting along stream channels would be mitigated by staying away from larger streams and implementing site-specific riparian management guidelines to protect smaller, non-perennial streams (Appendix A). Also, the following would be implemented to protect soil, riparian, and aquatic resources: Best Management Practices (BMPs), Forest Plan standards (if they provide greater protection than BMPs), and design and mitigation measures identified in Chapter 2 of this EA.

As under Alternative B, timber harvesting, and log landing and skid road development are not expected to affect aquatic habitat connectivity or the migration of aquatic species.

Potential adverse effects to aquatic species are expected to be small. As under Alternative B, impacts to aquatic resources are very limited, thus effects to aquatic species would be too. There would be no herbicide treatment, thus no effects from it.

Cumulative Impacts

Alternative A – No Action

Alternative A would not implement new activities. Thus, it is not expected to contribute cumulatively to the effects of past, present, or reasonably foreseeable future actions.

Alternative B – Proposed Action

As previously mentioned, streams in the Lower Clover project area currently have high fine sediment levels, simplistic habitat conditions, instable channels, barriers to aquatic migration, and are vulnerable to elevated stream temperatures. Turn of the century logging activities may have been a primary cause of these conditions. In a 1936 stream survey report, the Right Fork of Clover Run was described as follows: "the bottom is unstable and moves a great deal during floods…During timbering operations the stream bed was used for a skid way and the large rocks, boulders and stumps were blasted from the banks and bed of the stream. This destroyed pools, spawning areas and removed natural barriers to the movement of the stream bottom." Timber sales implemented since the 1950s, stream channelization activities, residential construction, and road construction and maintenance activities added to the effects of turn of the century activities.

In recent years, actions have been taken to reduce existing sources of sediment and the potential for new sources of sediment (see past and present watershed restoration activities). Some road work has also been conducted to reduce barriers to fish migration (bridge over SR 38). No projects have been implemented specifically to correct channel instability and simplistic in-stream habitat conditions; however, trees within riparian areas are maturing, and over time, trees along stream banks will die and fall into streams to help reduce existing stream channel instability and improve aquatic habitat conditions.

The specific effects reasonably foreseeable future actions may have on existing conditions are unknown. The possible creation of wildlife openings and water holes are not expected to affect aquatic resources because they are generally not created near streams and do not usually impact riparian habitat. Future mineral development, timber harvesting, and road construction/reconstruction would be expected to disturb soils and could release sediment to streams and impact riparian areas. However, the extent of such effects can't be anticipated given the lack of information available at this time.

The existence of steep slopes and some erosive soils in the project area, coupled with the results of past and present activities on Federal and non-federal lands, increase the risk that Lower Clover activities and foreseeable future projects may add to existing adverse aquatic conditions. However, given the limited extent of direct and indirect effects that it may generate, there is little risk that Alternative B would contribute substantially to adverse effects on fine sediment levels, stream shading, channel stability, aquatic habitat diversity, aquatic migration, or aquatic species occurrence. Alternative B activities would cause disturbance over existing conditions, but cumulative impacts are expected to be limited because few acres of soil (less than 1% of the project area) would be disturbed and because Best Management Practices, Forest Plan standards, and design and mitigation measures identified in Chapter 2 of this EA would be implemented. Downstream effects from Federal activities would be expected to be undetectable beyond the

project area boundary. It is unlikely any adverse effects on the aquatic community would be observable or measurable in the Cheat River.

Alternative C

The potential for Alternative C projects to cumulatively add, in any substantial way, to the riparian and aquatic effects of past, present, and reasonably foreseeable future action's is extremely remote and less than Alternative B. The direct and indirect effects of Alternative C would be so slight that there would be little risk of contributing substantially toward adverse effects on sediment levels, riparian areas, stream shade, channel stability, aquatic habitat conditions, or aquatic species occurrence. Riparian and aquatic resources would be protected as previously described. Activities on National Forest System lands would be expected to have little downstream effects beyond the project area boundary. It is extremely unlikely that any adverse effects on the aquatic community would be observable or measurable in the Cheat River.

Unavoidable Adverse Impacts

The alternatives would have minor adverse impacts as previously described.

Irreversible or Irretrievable Commitment of Resources

No alternative would result in irreversible or irretrievable commitment of riparian or aquatic resources.

Consistency with the Forest Plan

All the alternatives would be consistent with the Forest Plan goal of protecting natural resources of the Forest from damage and degradation; with soil, water, and fish resource standards and **guidelines; and Forest Plan Amendment 3, which updated fisheries management materials** (Forest Plan, pp. 40, 79-84, and 133-134).

Vegetation

Resource Impact Addressed

This section summarizes the existing condition of vegetation in the Lower Clover project area and explains how proposed alternatives may impact it. It addresses whether the alternatives help meet the desired future condition of the area, which is to increase the percentage of younger age classes in the Lower Clover project area and promote larger, older trees in existing stands by removing low quality, poorly formed, and diseased trees.

Affected Environment

Past land use activities (e.g. slash and burn agriculture, clearcutting, noncommercial thinnings, etc.) and natural disturbances (e.g. fires, wind, ice storms, and insect and disease) created the size, shape, age, and species of vegetation that exist in the Lower Clover project area today (Silviculture report, project file). Forest Plan standards and guidelines for Management Prescription 3.0 indicate that forest diversity will be enhanced by managing for a variety of forest types, sizes, and ages of trees. As the following tables demonstrate, the project area presently contains generally even-aged, closed-canopy forest over 60 years old with a wide mix of vegetative species.

Currently, the project area is dominated by saw timber (greater than 11.0" in diameter for hardwoods and 9.0" in for conifers) (Table 3-6).

Table 3-6: Size Classes on National Forest System Lands in the Project Area[1].

Size Class	Existing NFS Acres	% of Total NFS Acres	% of Total Acres (9165 acres of NFS and Non-federal lands)	Forest Plan Desired % of NFS Area
Open/Brush	32	0.6	0.3	5
Seedling/Sapling	507	9.7	5.5	10-20
Pole Timber	173	3.3	1.9	15-30
Sawtimber	4514	86.4	49.3	50-75
Total	**5226**	**100%**	**57%**	

[1]Figures in these tables should be considered approximations.

As the table shows, NFS lands in the Lower Clover Run area contain less than one percent openings, about 10 percent seedling/sapling (smaller than 5" diameter), less than five percent pole timber, and greater than 85 percent saw timber. This distribution is not consistent with Forest Plan MP 3.0 direction, which would have these lands contain more permanent openings, many more pole size, and less saw timber.

As table 3-7 indicates, over 87 percent of the National Forest System lands in the project area are greater than 60 years old. Approximately 65 percent are between 61 and 105 years old. Very little open/brush or early successional forest exists in the project area.

Table 3-7: Current Age Classes on NFS Lands in the Project Area*.

Age Class	NFS Acres	% of Total NFS Acres	% of Total Acres (9165 acres of NFS and Non-federal lands)
Open/Brush	32	0.6	0.3
0-15	184	3.6	2.0
16-30	261	5.0	2.9
31-45	67	1.3	0.7
46-60	143	2.7	1.6
61-75	585	11.2	6.4
76-90	945	18.1	10.3
91-105	1881	36.0	20.5
106-120	85	1.6	0.9
121-135	356	6.8	3.9
136-150	153	2.9	1.7
151+	534	10.2	5.8
Total	**5226**	**100%**	**57%**

*Figures in these tables should be considered approximations.

The Forest Plan does not specify specific age class objectives, but does so in actuality by assigning size class objectives (Forest Plan, page 129). The Forest Plan also states "It is the ultimate objective of the Forest to balance age classes of the primary Forest types on all...lands on which even-aged management is applied..." (Forest Plan, p. 74, 2410, VI, Timber Regulation, B, #4). It also indicates forest diversity will be enhanced by the dispersal of different ages and types of vegetation (Forest Plan, p. 129, 1900, VI, A).

Table 3-8 identifies the major vegetation types that exist in the project area. Today, the Lower Clover area is nearly two-thirds mixed oaks, which is a combination of species such as red oak, white oak, chestnut oak, yellow poplar, sugar maple, red maple, basswood, beech, white ash, and black cherry. Sugar maple is a common understory species, as are beech and striped maple.

Table 3-8. Existing Forest Types in the Lower Clover Project Area*.

Forest Type	Acres	% of Total NF Acres	% of Total Acres
Non-federal lands - Not Typed	3939	0	43.0
Eastern White Pine	130	2.5	1.4
Oak – Eastern White Pine	32	0.6	0.4
Chestnut Oak	175	3.4	1.9
Black Oak – Scarlet Oak – Hickory	555	10.6	6.0
Yellow Poplar – White Oak – Northern Red Oak	171	3.3	1.9
Mixed Oaks	1559	29.9	17.0
River Birch – Sycamore	12	0.2	.1
Black Cherry – White Ash – Yellow Poplar	7	0.1	.1
Mixed Upland Hardwoods	2553	48.8	27.9
Opening	32	0.6	0.3
NFS and Non-federal Total	9165	100 %	100 %

*Figures in these tables should be considered approximations.

The Forest Plan does not specify specific forest type objectives, but, it indicates the Forest will be a mosaic of stands of predominantly hardwood trees and associated understories…the stands will vary in…species depending on the silvicultural system applied (Forest Plan, p. 127, Desired Future Condition).

Field reviews confirm that stands proposed for thinning/stand improvement harvesting are over crowded; trees are competing for light, nutrients, and water. The Forest Plan states that thinnings will be a normal practice, particularly on better sites (Forest Plan page 135). There are also grapevines in some stands that can affect stand health or regeneration of new stands. No substantial disease or insect infestations (e.g. beech bark scale disease, gypsy moth, and hemlock woolly adelgid) were noted. All three insects and disease are of concern due to their presence or nearby presence and the potential impacts.

Field reviews confirm deer are abundant in the Lower Clover project area and surrounding areas (deer browse can inhibit regeneration).

Scope of the Analysis

The scope of analysis for direct, indirect, and cumulative effects was the project area because it is the area focused on to attain desired Forest Plan future conditions. The temporal boundary used for direct and indirect effects analysis was 1 to 7 years, since that is the time frame in which timber sales are generally completed and revegetation occurs. The boundary for cumulative effects would be 10 years, since this is the time when the project area could reasonably be expected to receive additional vegetative treatment (Forest Plan, p. 133).

Methodology

CDS data and information obtained during field visits were used to compare the existing condition of the project area with Forest Plan desired future conditions for Management Prescription 3.0 areas and the condition that will likely result from implementing Lower Clover alternatives. Impacts on size classes, age classes, and forest types are noted.

Environmental Consequences Common to All Action Alternatives

Alternative B and C propose to develop the same log landings and complete the same road work; the same acres and locations would be affected. Log landing development, road improvements, reconstruction, and abandonment are not expected to noticeably affect existing size class, age class, or forest type distribution of the project area because most landings are being developed in existing openings and few acres of forested stands would be cut. TR 125 construction and construction of temporary roads would likely remove trees, but again, the impacts on size class, age class, or forest type would be negligible since few acres (less than 10 acres) would be affected.

Direct/Indirect Environmental Consequences

Alternative A – No Action

Alternative A would not harvest trees to change the existing size or age classes or forest types of the project area. In the short term, the existing percentage of size classes, age classes, and forest types would be expected to persist. In the long term, natural processes (aging) and disturbances (e.g. wind, ice, disease, insects, fire, etc.) may influence size, age, and forest type diversity. The extent of the oak, cherry, and yellow poplar found today is largely the results of turn of the century logging.

Stands are expected to continue to age, thus more acres would move into older age classes. Natural processes and disturbances may create additional grassy openings and cause the decline in saw timber and increase the percentage of seedling/sapling and pole size timber; but the extent of such changes cannot be predicted. As stands mature, fewer shade intolerant species (oak species, poplar, and cherry) would be expected in the area; over time, shade tolerant maple species and beech (which currently exist in the understory of Lower Clover stands) are expected to replace shade intolerant oak species, cherry, and yellow poplar. The extent and distribution of such changes cannot be predicted; it is unlikely desired Management Prescription 3.0 future conditions would be obtained without management.

In the absence of thinning/stand improvement harvesting, there is no opportunity to improve a stand's productivity nor to recover those trees that would inevitably succomb to the competition. Stands would continue to be over crowded until, over time, competition causes the natural decline and death of some trees. As trees age or as natural thinning occur in stands, there will likely be an increase in large dead and dying trees. As they get older or are crowded, trees are expected to become more susceptible to disease and insect infestations; the extent and occurrence of such infestations are not known.

Alternative B – Proposed Action

Two-age harvests proposed under Alternative B would regenerate forested stands to increase the percentage of younger age classes in the project area. Efforts would be made to retain snags, culls and den trees (unless they present a safety hazard during operations). Proposed thinning would reduce vegetative competition and promote larger, older trees on about 109 acres, allowing remaining healthy well-formed hardwood trees to grow larger and increase in value.

These actions would help meet the desired future conditions of having a mosaic of stands of predominantly hardwood trees and emphasizing large, high quality hardwood trees for lumber and veneer (Forest Plan, p. 127). They would also help ensure stands vary in size, shape, height, and species.

The 380 acres of regeneration proposed under Alternative B would move about 7% of the acres in the project area from saw timber into the seedling/sapling size class. Thinnings would not affect the percentage of each size class. The size class distribution that would result from implementing Alternative B follows:

Table 3-9: Size Classes on NFS Lands in the Project Area under Alternative B*.

Size Class	Existing NFS Acres	NFS Acres Under Alternative B	% of Total NFS Acres Under Alternative B	% of Total Acres (9165 acres of NFS and Non-federal lands)
Open/Brush	32	32	.6	0.3
Seedling/Sapling	507	887	17	10
Pole Timber	173	173	3.3	1.9
Sawtimber	4514	4134	79.1	45.1
Total	**5226**	**5226**	**100%**	**57%**

*Figures in these tables should be considered approximations.

As the table indicates, the saw timber size class would still dominate forested stands on National Forest System lands within the project area; but, it would come closer to meeting the desired future condition of 50-75% of the project area in this size class (Forest Plan, p. 129). The seedling/sapling size class would remain within the desired future condition range of 10-20%. The percentage of pole timber would not change in the short term but would increase in the long term.

The 380 acres of regeneration harvests would also change the **age class** distribution of the area. It would move acres from the 70+ years old age classes to the 0-15 age class. Thinnings would not affect the distribution of age classes across the project area. Implementing Alternative B would result in the 0-15 age class rising from 184 acres to 564 acres of the project area (an increase from less than 4 percent to about 11 percent of the NFS lands in the project area). The 61-105 year age classes would continue to dominate NFS lands within the project area.

Neither proposed regeneration harvests nor thinnings are expected to cause a change in existing **forest types**; they would remain as identified in Table 3-8. Regeneration success of existing forest types could be affected by competition with other vegetative species and deer browsing. However, proposed site preparation and herbicide use are expected to inhibit competition from shade tolerant species (such as striped maple and beech) and grapevines that exist in the area to ensure shade intolerant species (oak species, cherry, and yellow poplar) persist in regenerated stands. Also, planting and fencing would be implemented if necessary to mitigate deer browsing. These actions would help ensure successful regeneration of desired species.

Proposed herbicide may be applied before and/or after timber harvest. It could be applied anytime of year. The basal bark spray, hack and squirt, or cut stump methods are very selective (species specific) methods that would be used to control striped maple, beech and grapevine (most striped maples and beech treated would be seedling or sapling size, possibly a few

reaching pole size). Due to the limited nature of application (low pressure backpack sprayer and treating only striped maple, beech, and grapevine), limited area involved (up to about 7 percent of the area) and mitigations to be applied, no negative effects are anticipated. Only individual stems in selected stands would be treated with herbicide. Mechanized spray equipment or aerial spraying would not be used. Application rates would not exceed those specified on the label.

The Human and Health and Ecological Risk Assessments for Glyphosate (SERA 2003a) and Triclopyr (SERA 2003b) provide lengthy explanations of a range of possible human health and ecological risks of these herbicides. These assessments and the Final Environmental Impact Statement (FEIS) for Vegetation Management in the Appalachian Mountains (USDA 1989) are applicable to the Lower Clover project area. The 1989 FEIS described the effects of herbicide in the Appalachian Mountain area; it covered part of West Virginia and two National Forests in Virginia adjacent to the Monongahela National Forest. The methods of herbicide use on the Monongahela are similar to the methods described in the Region 8 analysis. Environmental conditions and management practices found on the Monongahela are similar to those found in western Virginia.

Triclopyr is considered a safe and effective forestry herbicide. It is readily absorbed and translocated within target vegetation. It is not active in the soil. Studies indicate it should not be a leaching problem under normal use. Triclopyr rapidly photo degrades, and is readily subject to microbial degradation in soil. It has an average half-life of 46 days in soil, but in studies of surface water its half-life has been less than 10 hours (USDA 1989). Their effects to water and aquatic resources are explained in the Watershed effects section. In regards to human health risks, the lowest margin of safety for triclopyr under typical exposure conditions was 1000, for both systemic and reproductive effect categories, and that was for on-site dermal exposure (USDA 1989). Triclopyr was not found to present a significant risk of heritable mutations or cancer. Given that it would be used according to label instructions, applying triclopyr would not have significant adverse effects on human health. This is substantiated in the Region 8 FEIS.

Proposed treatments are not expected to substantially influence the three current primary insects of concern: gypsy moth, beech scale, and the hemlock woolly adelgid. Overall, management regimes that provide access, stand variety and treatment generally reduce the susceptibility and vulnerability of impacted stands and aid in any prescribed treatment should it become necessary.

Alternative C

Alternative C would not implement actions that would change the percentage of each size class, age class, or forest type that exists in the project area. Proposed thinnings would help meet the need of reducing vegetative competition to promote larger, older trees in existing stands; this would promote predominantly hardwood trees and emphasize large, high quality hardwood trees for lumber and veneer consistent with Forest Plan direction (Forest Plan, p. 127). It would not help meet the desired future condition of having a mosaic of stands in the project area because it would not create young stands.

Cumulative Impacts

Alternative A – No Action

Many factors affect the mosaic of the Forest. Natural processes and disturbances (e.g. wind, ice, insect, disease, fire, etc.) and many of the past and present activities identified at the beginning of Chapter 3 that have been implemented on federal and non-federal lands contributed to the size,

age, and forest types that exist in the area now (e.g. past timber harvesting and associated road building; mineral development; etc.).

Existing size classes, age classes, and forest types on National Forest System lands are identified in the affected environment section. The exact size, age, and forest type of vegetation on the approximately 3939 acres of non-federal lands (about 43 percent) in the project area is not known. Cutting practices on private lands in the project area would be expected to be similar as that commonly found throughout West Virginia. Selective cutting reduces the number of faster growing species, principally red oak, black cherry and yellow poplar. Thus, the overall stand condition would be degraded, meaning the stand remaining generally would consist of slower growing and less valuable species.

Alternative A would not implement activities that would change the size, age, or forest type diversity of the area. As previously mentioned, natural process would likely cause changes in size, age, and forest type diversity, but the extent and distribution of such change cannot be accurately predicted. In the short term, they are expected to remain similar to what they are now.

In the long term, natural processes and disturbances and future activities on federal and non-federal lands (except for maintenance activities such as for roads and openings or small mineral exploration activities) are expected to change the size, age class, and forest type diversity of the area.

Timber harvesting on non-federal lands may affect within stand size and age class diversity, but it is not expected to substantially affect size and age class diversity across the project area. This is because diameter-limit cutting is usually used on non-federal lands; this removes most trees over a certain diameter and is not considered a regeneration treatment. Future timbering is expected to change forest type diversity on non-federal lands; this is because diameter limit cuts favor more shade tolerant species such as maple and beech.

It is highly unlikely that implementing Alternative A over time would ensure balanced size and age classes are created across the project area consistent with Forest Plan direction. Over time, forested stands would continue to age and eventually decline in vigor and health.

The no action alternative would favor natural succession and therefore more shade tolerant tree species and would not provide a more sequential (even) early successional habitat development. No management actions would be implemented during this entry to control species that compete with less shade tolerant hard mast species. Striped maple and beech sucker sprouts would expand to dominate the mid-story of many stands, decreasing vegetation diversity and continuing regeneration problems of intolerant and moderately intolerant tree species.

Alternative B – Proposed Action

The cumulative effects of past, present, and future activities and of applying Alternative B harvest methods would be a mix of stands of different ages and species. Applying even-aged regeneration harvest methods would help move the area toward a balance of size and age classes and would maintain a diversity of forest types across the project area. Thinnings would allow continued management of high quality hardwoods while removing low quality, high risk, diseased and mature trees.

The herbicide treatment proposed under Alternative B is not expected to result in adverse cumulative effects. Due to the limited nature of application in the Lower Clover project area (low pressure backpack sprayer and targeting specific species), limited area involved (up to

about 7 percent of the area) and mitigations to be applied, no substantial cumulative adverse effects are anticipated. Only individual stems in selected stands would be affected by with herbicide. Mechanized spray equipment or aerial spraying would not be used. Application rates would not exceed those specified on the label.

Alternative C

The cumulative effects of Alternative C would be similar to Alternative A, except approximately 469 acres of federal lands would be thinned to reduce competition and promote the growth of larger hardwood trees. Since no herbicide would be used under this alternative, there would be no potential for herbicide related cumulative effects.

Irreversible or Irretrievable Commitment of Resources

Alternative B and C would result in irreversible commitment of vegetative resources in that trees would be cut and removed from the project area. However, none of the alternatives would result in an irretrievable commitment of vegetative resources since vegetation would grow back after harvesting.

Consistency with the Forest Plan

Alternative A and C would not be consistent with the desired future condition described in the Forest Plan for Management Prescription 3.0 in that no action would be taken to move the area's existing size or age classes to desired percentages. Alternative B would be consistent, in that it would move approximately 7 percent of the project area from saw timber to seedling/sapling sizes.

Old Growth/Mature Habitat

Resource Impact Addressed

This section discloses the impacts proposed Lower Clover alternatives may have on existing, potential, and future mature forest in the Lower Clover project area.

Affected Environment

The project area and surrounding areas are roaded and managed landscape located about five miles form Parsons, WV. Approximately 57 percent of the project area is made up of National Forest System lands and about 43 percent is made up of non-federal lands. National Forest System Land in the project area is about 99 percent forested (see Vegetation effects). The exact percentage of forest on private lands is not known, but digital photos indicate about 80 percent of the non-federal land is forested. The project area is surrounded mostly by other roaded and managed MP 3.0 areas (see Management Prescriptions Map in the Roads Analysis Report). It is not connected to large, undisturbed areas of National Forest System lands such as wilderness or semi-primitive non-motorized settings such as provided in Management Prescription 6.2 areas.

Currently, about 20 percent of the project area could be considered mature habitat/old growth because about 1,054 acres of the project area are 120+ years old. About six percent (about 331 acres) of the project area is officially designated and managed as mature habitat (see 1991 Lower Clover Decision Notice). Management Prescription 3.0 direction would have five percent (about 260 acres) of the National Forest System land within the project area be old growth or mature habitat; thus, one percent more than required is designated for management as old growth. The following table shows the acres, age, and forest type of stands officially designated as old growth.

Table 3-10. Existing designated old growth stands in the Lower Clover project area.

Forest Type	Age Class in 2004			Total
	101-110	121-130	151-160	
Black oak/scarlet oak/hickory	0	0	42	42
Mixed oaks	37	0	36	73
Mixed upland hardwoods	129	87	0	216
Total	166	87	78	331

The above acres were designated to provide wildlife habitat and meet wildlife habitat goals in a roaded and managed landscape.

Scope of the Analysis

Direct and indirect effects to older aged forests and designated old growth in the Lower Clover project area were considered over the next five years, the time it could take to implement proposed alternatives. Cumulative impacts were determined based on past, present and reasonably foreseeable future actions in the project area in the next 1-10 years; 10 years is the likely period between entries in this project area for active management such as timber harvest. The Lower Clover project area was used as the spatial boundary for direct, indirect, and cumulative effects because effects to mature habitat and old growth are expected to be limited, and the project area is representative of the conditions within the Management Prescriptions 3.0 areas that surround it.

Methodology

Tree species composition, age, and relative density data were used to assess how proposed Lower Clover alternatives may impact designated old growth stands and stands 120+ years.

Environmental Consequences Common to All Action Alternatives

Under Alternative B and C, proposed road improvements, construction, and reconstruction and log landing development would not affect designated old growth stands and would not noticeably affect mature habitat. This is because road improvements would occur within existing right of ways and would affect little forested growth outside of the right of ways. Road construction and reconstruction is not expected to have much of an adverse impact because it would affect less than nine acres. Most log landings are being proposed in areas that are already openings or have been used as openings in the past and have young growth in them. Under Alternative B and C, the forested areas not proposed for timber harvest activities and road activities would continue to mature and change in structure, size, and species composition.

Direct/Indirect Environmental Consequences

Alternative A – No Action

As there would be no projects implemented under Alternative A, there would be no negative effect to mature habitat or designated old growth. Forested stands in the project area would continue to age and mature. Vertical stand structure would increase in diversity within stands, and diversity between stands slowly would decrease as all stands would trend toward uneven-aged conditions.

Alternative B – Proposed Action

Regeneration harvests proposed under Alternative B would affect about 380 acres of the approximately 4,400 acres of stands 70+ years old (approximately nine percent), and about 27

acres (about ½ percent) of mature habitat (stands over 120 years old). The following table displays the acres of each age class that would be affected by regeneration harvests.

Table 3-11. Age classes affected by proposed regeneration under Alternative B.

Age Class	Acres Prior to Harvest	Acres Proposed for Harvest	Acres After Harvest
0-10	66	0	446
71-80	834	60	774
81-90	586	112	474
91-100	1,179	147	1,032
101-110	754	34	720
141-150	180	11	169
151-160	551	16	535
Total	**4,150***	**380**	**4,150**

*Doesn't include the acres within the 111-140 age classes.

Thinning would not reduce the number of stands of 120+ years old. It could alter the structure within thinned stands and increase the diameter growth of the trees not harvested.

Alternative B would not negative impact the approximately 331 acres of designated old growth because none of the designated stands are proposed for timber harvest, landing construction, or road improvement, construction, or reconstruction.

Ninety-two percent of the forested area in national forest ownership would continue to mature and grow. Riparian areas adjacent or within harvest units would be protected via riparian buffers (Appendix A). These areas would also serve as future mature habitat.

Alternative C

Alternative C would not remove acres from the 120+ year old age classes because it would not regenerate stands. It would thin about 469 acres. These thinnings would have the same affect on within-stand structure as described under Alternative B. None of the approximately 331 acres currently designated as old growth would be affected by Alternative C activities. All forested stands in the project area would continue to age and change in structure and composition.

Cumulative Impacts

Alternative A – No Action

As the past, present, and reasonably foreseeable future table at the beginning of Chapter 3 indicates, the project area and the Lower Clover watershed are heavily managed. Past and present activities on federal and non-federal lands have reduced acres of older age classes in the past. Reasonably foreseeable future activities (such as creating wildlife openings and waterholes, constructing Corridor H, and developing gas wells) could affect older age classes in the future; the extent of which is not known since specifics about these projects are not known. However, as there would be no harvest, road construction, or reconstruction projects implemented under Alternative A, there would be no cumulative negative effect to mature habitat or designated old growth.

Forested stands in the project area that are not affected by present or future activities would continue to age and mature. Vertical stand structure would increase in diversity within stands, and diversity between stands slowly would decrease as all stands would trend toward uneven-aged conditions. It is assumed that the six percent of the National Forest System lands in the

project area that is currently designated and managed for old growth would continue to be protected; if not, that stands would be identified as replacements as identified by Forest-wide standards and guidelines on pages 55-56 of the Forest Plan.

Alternative B – Proposed Action

Alternative B timber management activities would change the age of stands of trees, forest structure, and reduce the acres of 120+ year old stands by about 0.5 percent. However, these effects are not inconsistent with the overall landscape context, compared to the desired future condition for the area, and the goals and objectives for the management prescription area. In a Management Prescription 3.0 area, negative impacts to potential mature habitat are acceptable; there is little emphasis on remote, undisturbed forests. Removing 0.5 percent of the 120+ year old stands is not expected to lead to substantial cumulative impacts when combined with the past, present, and reasonably foreseeable future actions identified at the beginning of Chapter 3.

None of the designated old growth would be affected by Alternative B, thus, there would be no cumulative effects to designated stands. As described under Alternative A, forested stands in the project area not affected by present and future activities would continue to age and mature.

Alternative C

Alternative C is not expected to noticeably contribute to the reduction of 120+ year old stands caused by past, present, and reasonably foreseeable future actions. As previously mentioned, development of roads and landings would not noticeably reduce acres of 120+ year old stands. Thinnings proposed under Alternative C would not regenerate stands. Alternative C would not impact the six percent of the project area currently designated for management as old growth.

Alternative C would change stand structure within approximately 469 acres. This would not affect existing mature habitat or the potential for future mature habitat to develop. As described under Alternative A, forested stands in the project area not affected by present and future activities would continue to age and mature.

Unavoidable Adverse Impacts

Alternative A and C would not result in unavoidable adverse impacts to mature habitat/old growth because neither alternative would regenerate stands. Alternative B would regenerate about seven percent of the project area. This would reduce 120+ year old stands by 0.5 percent, but it would not affect the six percent of the project area currently designated for mature/old growth management.

Irreversible or Irretrievable Commitment of Resources

Alternative A and C would not result in an irreversible or irretrievable commitment of mature/old growth because neither would regenerate stands in the project area and road activities and log landing development are not expected to noticeably affect 120+ year old stands. Alternative B would result in an irreversible commitment of seven percent of 70+ year old stands, but this would not be irretrievable in the long term because trees would regenerate and grow older in these stands over time.

Consistency with the Forest Plan

Actions proposed in Alternatives A, B, and C would be consistent with Forest Plan vegetation standards and guidelines for Management Prescription 3.0 areas and Forest-wide old growth standards (Forest Plan, pp. 127-129 and 55-56). All alternatives would preserve the six percent of the project area that is currently designated as mature habitat/old growth.

Non-native Invasive Species (NNIS)

Resource Impact Addressed

This section identifies the non-native invasive species (NNIS) that exist in the project area now and explains how proposed alternatives may affect the introduction and spread of NNIS.

Affected Environment

Multiflora rose (*Rosa multiflora*), coltsfoot (*Tussilago farfara*), Japanese stiltgrass (*Microstegium vimineum*), and crown vetch (*Coronilla varia*) are known to exist in the area. Multiflora rose occurs on FS 767a and FS 767 in Compartment 15, stands 15 and 23 and TR 125 in Compartment 20, stands 14.1, 14.2, and 14.3 (Botany Surveys, 2003 and 2004). Coltsfoot exists on FS 767a in Compartment 15, stand 15. Japanese stiltgrass is on an old, unnamed road in Compartment 19, stands 9 and 10. Crown vetch was found on FS 859 in Compartment 20, stand 57. No NNIS plant species were found in the general forested areas.

Scope of the Analysis

The spatial boundary for direct, indirect, and cumulative effects was the project area because although only a portion of the project arae was surveyed (only areas proposed for activities), the risk for spread of NNIS is to the entire project area. The temporal boundary was the recent past, and the next 1 to 15 years because this is the likely entry cycle of this area.

Methodology

Botany surveys were completed in 2003 and 2004. Data from the surveys were used to assess how proposed activities may affect NNIS populations and distribution.

Direct/Indirect Environmental Consequences

Alternative A – No Action

Alternative A would not implement activities that would affect existing populations of NNIS or introduce new populations. NNIS found during recent surveys tend to be species that flourish in open conditions or near the edge of open areas. Japanese stiltgrass is the only NNIS known in the area that has the potential to invade into the forest understory even if no action is implemented; multiflora rose, coltsfoot, and crown vetch are not expected to invade forested areas. All four NNIS could spread into openings created form natural disturbances near these populations. They also are likely to continue to spread along road corridors regardless of disturbances.

Alternative B – Proposed Action

Existing populations of multiflora rose, coltsfoot, and crown vetch are not expected to be noticeably affected by proposed activities because timber in the stands in which they are found would be yarded by helicopter -- no skid roads would be made in the stand that would create conditions for rapid spread of NNIS. Japanese stiltgrass could move into the understory regardless of the actions proposed in Alternative B.

Alternative C

The effects under Alternative C would be much the same as under Alternative B. No NNIS plant species were found in the general forested areas. Those found on roads in the project area tend to be species that flourish in open conditions or near the edge of open areas. Activities are not expected to advance the spread of existing populations of NNIS; no skid roads would be made in the stands that would create conditions for the rapid spread of NNIS. Japanese stiltgrass has the potential to invade into the forest understory, whether or not activities are implemented.

Cumulative Impacts

Alternative A – No Action

Alternative A would not implement actions that would directly or indirectly affect existing populations of NNIS, thus, it would not contribute cumulatively to the effects of past, present, and reasonably foreseeable future activities on Federal and non-federal lands, although some NNIS are likely to spread and new ones move into the area regardless.

Japanese stilgrass has the potential to spread regardless of alternative. The extent and density of NNIS across the Forest is not known, surveys of selected areas are underway (Summer/Fall 2004). It is likely that various NNIS exist across the Forest and on private lands. Given limited funds, the variety of species, and the fact that not all NNIS can be controlled everywhere, the Forest will have to prioritize areas for treatment. Since no threatened, endangered, and sensitive plants were found in areas of the project area proposed for activities, little potential habitat exists, and no threatened, endangered, or sensitive plants were known to be in the area from previous surveys, the project area is likely not a high priority for NNIS treatment. Along with prioritization of areas to treat, is the prioritization of species to treat. Some NNIS have been a part of the landscape since colonial time, such as coltsfoot, and tend to stay in continually disturbed areas such as road cuts. Treatment of these species, which would likely include herbicide, would be a large input (e.g. time and money) for little return. In the long run, an emphasis on using native seed in revegetating road cut and fill areas will have greater impact on retaining native diversity than treating roadside weeds on all roads regardless of ecological risk.

Alterantive B – Proposed Action

Earlier in this chapter is a list of past, present, and reasonably foreseeable actions on the Forest, and land in other ownerships, that could impact resources in the project area; most of them could affect the spread of NNIS. Given that all the NNIS found in the project area were found along roads, not in general forested areas, it is likely road related activities associated with Alternative B would be the most likely activity to introduce or spread NNIS. The effects are likely to overlap in space and time with other actions, and NNIS may spread without action.

There is likely a similar mix of NNIS on non-federal lands, both those that stay in or near road corridors and those with potential to spread under the shade of forest canopy, but we do not know the extent or density of the infestations. Any treatment of NNIS on National Forest land must weigh the possibility of continued spread from non-federal lands when prioritizing areas and species to treat. With the mix of non-federal land and forest and agricultural lands in the project area, this area may not be a high priority for treatment of NNIS when considered with other, more isolated and sensitive areas.

Alternative C

The effects of Alternative C would be similar to those of Alternative B.

Unavoidable Adverse Impacts

Proposed activities could introduce or cause the spread of NNIS, as mentioned above, but the effects are not expected to be substantial.

Irreversible or Irretrievable Commitment of Resources

None of the alternatives would so greatly affect the introduction or spread of NNIS that it would cause an irreversible (e.g. extinction of a native species) or irretrievable (e.g. loss of native species for a time) commitment of resources.

Consistency with the Forest Plan

Proposed alternatives would be consistent with Forest Plan direction on page 84c that states project analyses will consider, as needed, ways of minimizing or eliminating threats to threatened, endangered, and proposed species due to NNIS. There are no other Forest Plan standards and guidelines specific to management of NNIS.

Threatened, Endangered, and Sensitive Flora

Resource Impact Addressed

This section documents the findings of surveys done in the Lower Clover project area. It also discloses how Lower Clover alternatives may affect threatened, endangered, and sensitive plants know to occur in the project area.

Affected Environment

No threatened, endangered, or sensitive plant species were found during recent surveys of stands proposed for management in the Lower Clover project area. Surveys noted that the areas surveyed are in areas known for lack of floristic diversity. While the project area does have some diversity in that both dry and moist sites are found in the area, none of the areas are unique in diversity. No specialized or unique plant habitats were encountered in the stands surveyed. Wet areas were limited and not very diverse.

Some habitat of poor quality was found for small whorled pogonia and butternut; habitats for other threatened, endangered, or sensitive species were not found. Forest records indicate at least one butternut tree was found in the past in Compartment 19, stand 41, near the boundary with stand 39 (neither of which would be affected by proposed alternatives). Also, within the watershed, but outside the project boundary, running buffalo clover was found on private land.

Scope of the Analysis

The project area boundary was used as the spatial boundary for direct, indirect, and cumulative effects because plants are not expected to spread into or out of the area within the near future. The temporal boundary used to assess direct and indirect effects to plant species was five years from the date a sale is awarded (this is the time period in which timber activities could disturb plants). The temporal boundary for cumulative impacts was up to 15 years, based on the time frame in which reasonable foreseeable future actions and known future actions could occur.

Methodology

Surveys for threatened, endangered, and sensitive plants were conducted in the project area in 2003 and 2004. Direct and indirect impacts were assessed by comparing locations of known sensitive plant species and locations of proposed active management. The number of sensitive species sites potentially impacted by alternative was the basis for comparing the alternatives for effects to the resource.

Direct/Indirect Environmental Consequences

Alternative A – No Action

As there are no activities proposed in Alternative A, there would be no negative effect to threatened and endangered plant species or plants on the Regional Foresters sensitive species list. Effects of this alternative are the continued maturing of the forest and only natural disturbance to habitat and populations of plant species. Some threatened, endangered, and sensitive plants need disturbance to survive and increase in numbers (running buffalo clover and butternut for

example) so maturing of the forest is not likely to positively impact these species. However, since no threatened and endangered or sensitive species are known from the area and only poor quality habitat was found in recent surveys, the effects, either positive or negative, of Alternative A are negligible.

Alternative B – Proposed Action

Alternative B would not adversely impact threatened, endangered, or sensitive plant species in the Lower Clover project areas. No threatened, endangered, or sensitive plants were found in stands proposed for actions. Also, as surveys documented, there is little potential habitat for any threatened, endangered, or sensitive plant species in the project area; potential habitat would not be negatively impacted by the proposed actions.

Alternative C

As under Alternative B, there would be no impacts to threatened, endangered, or sensitive plant species in the Lower Clover project area from actions proposed in Alternative C. No threatened, endangered, or sensitive plants were found in the stands proposed for actions. Also, as surveys documented, there is little potential habitat for threatened, endangered, or sensitive plant species in the project area.

Cumulative Impacts

Since no threatened, endangered, or sensitive plants were found, and only limited, poor quality habitat found, none of the alternatives are expected to contribute cumulatively to the impacts of past, present, and reasonably foreseeable future actions.

Unavoidable Adverse Impacts

None of the alternatives would result in unavoidable adverse impacts to threatened, endangered, or sensitive plant species, as explained above.

Irreversible or Irretrievable Commitment of Resources

None of the alternatives would result in the irreversible or irretrievable commitment of threatened, endangered, or sensitive plant species or their habitat, as explained above.

Consistency with the Forest Plan

All alternatives would be consistent with the Forest Plan goal of protecting sensitive and unique species until their populations are viable (Forest Plan, p. 37). Also, they would be consistent with Forest-wide standards and guidelines that would avoid activities in known threatened, endangered, and proposed species populations and occupied habitat (Forest Plan, p. 84a) and afford sensitive species the highest possible protection commensurate with other appropriate uses and benefits and include measures in project design if sensitive species are found (Forest Plan, p. 87a).

Wildlife Effects

The wildlife analysis currently is in draft form. Prior to finalizing the EA, it will be reformatted to match the rest of the document and will be checked for consistency with other resource sections. Currently it does not contain sections addressing Regional Forester's Sensitive Species and habitat fragmentation. These sections will be added prior to release of the final document.

Affected Environment: The Forest Plan designates MP 3.0 to be managed for species tolerant of disturbance – for example, white-tailed deer, ruffed grouse, gray squirrels, and associated species. Some of the associated species include gray and red foxes, bobcats, cottontails, southern flying squirrels, woodpeckers, owls, songbirds, and certain amphibians (see Forest Plan, L-2, for complete list). The Forest Plan recommends a mosaic of hardwood stands varying in size, structure, and species composition to provide habitat for a variety of wildlife species (p. 127).

Effects of large scale projects on wildlife cannot be generalized because of the variety of habitat components required by different wildlife species and communities. A management method that creates habitat for one species may remove habitat for another. One of the most basic objectives of wildlife management is to maintain native wildlife populations, with a particular emphasis on threatened, endangered, or sensitive (TES) species (Hunter 1990). This section evaluates the effects of the proposed projects on species in the deer/gray squirrel associations. Effects will be based on habitat management, mast and other food resources, and disturbance. Effects on TES species are addressed in another section of this chapter.

The Forest Plan standards and guidelines for wildlife management in this prescription emphasize the even-aged system of silviculture when shade intolerant species such as oaks are the species objective (p. 134). The gray squirrel and associated species are to be emphasized in oak/hickory stands, and deer are to be emphasized on other sites. Mast production, and especially acorn production is a primary component of gray squirrel habitat, and therefore is a very important wildlife habitat consideration in this prescription. Other habitat components called for in the Forest Plan for this prescription include creation of permanent wildlife openings, retention of down woody debris, establishment of high value wildlife trees and shrubs such as soft and hard mast trees and scattered evergreens for cover, retention or creation of natural and artificial wildlife dens and cavities, creation of permanent water sources, protection of seeps, protection and improvement of cold water fisheries, and retention of streamside vegetation (p. 136). These activities serve as a means of attaining diverse tree stands, openings, and open understory conditions, which have been noted to provide benefits for wild turkey and bear (Bailey and Rinell, 1968; Miller, 1975; Rieffenberger et al., 1981; Wunz, 1989; Wunz, 1990). Deer and other species associates can benefit from the additional food, cover, and nest sites provided by tree seedlings and saplings, forbs, grasses, blackberries, etc., even-aged regeneration areas (Robinson and Bolen, 1984).

The wood thrush, another species in this association, is an interior species that requires larger areas of mature forest. Robbins (1979) estimates that 250 acres is the minimum forest area required to sustain viable breeding populations of this thrush. A challenge is to maintain sufficient habitat for interior species while providing for the needs of desired edge and early successional species. Maintaining canopied stands of a sufficient size, interspersed with younger stands throughout the landscape, would provide habitats for a variety of wildlife species requiring different seral stages and habitat types.

Various species of oak, including northern red, white, chestnut, and scarlet oaks, are very abundant within the project area and provide a considerable amount of mast for wildlife. Hickories and black walnut are also present, providing additional hard mast sources for squirrels and other species. These mast producing species are shade intolerant or have intermediate tolerance to shade. Seedlings may sprout beneath an overstory canopy, but unless the overstory is removed by some natural disturbance or by silvicultural management, the majority of seedlings will die off or remain as stunted understory trees. Other species occurring in this project area, which contribute to a varied food supply, include American beech, yellow poplar, eastern hemlock, grape, and greenbrier.

Most of the species in the gray squirrel/deer species associations are considered to be tolerant of human disturbance to some degree. Short-term disturbance from proposed projects would include soil disturbance during road construction, tree felling, and skidding; noise and other equipment presence; and increased human activities during project implementation. Long-term disturbance could occur after project completion if new roads or road improvements facilitate human access into the area.

Alternative A – No Action: In this alternative, no trees would be cut, no roads would be constructed, reconstructed, improved, or abandoned, and no herbicide use, or site prep work would occur. Little early successional habitat would occur other than in openings created by natural disturbances, such as fire, windthrow, severe ice damage, and insect damage. Early successional species would find habitat located in small patches scattered throughout the area. Some species needing larger areas of this type of habitat would probably decline as the previously harvested units continued to mature. Woodpeckers and cavity nesters would be maintained at current levels or possibly increase as more snags and dying trees became available. Any area-sensitive species requiring larger expanses of closed canopy forest would be maintained at current levels, unless natural catastrophic events affected large areas.

With no habitat management to enhance browse or mast availability, management activities would not have an impact on deer populations in the short term. However, over the long term, lack of management actions in the project area would reduce the amount of available browse.

No trees currently producing mast would be removed; however, no mast trees would be regenerated for future sustainable yields. Cherry, oak, and hickory would not regenerate over wide areas unless there were a natural disturbance in the area, such as fire, windthrow, or insect damage. Mast production of black cherry, oak, and hickory could decrease in perhaps 40-50 years when existing mast trees begin to decline in mast production and are not replaced by younger trees. Deer and other wildlife populations could be affected by the reduction in mast production across the area.

Mast producing shrubs would remain in the understory but would not produce as much mast as they would in a managed forest where light conditions in the understory would be increased by management actions such as thinning and two-age harvests. Natural breaks in the canopy due to overstory tree mortality would allow additional sunlight to reach mast producing shrubs, however.

Affects on wildlife from human activities in the project area would remain static. Wildlife would not experience increased disturbance or other effects from equipment use, road compaction, soil disturbance, human presence, or vehicle traffic since this alternative would not include those

activities. Access and use of the area would remain at the current levels with no expectation of any increased use of the area.

Alternative B - Proposed Action: The Proposed Action would create approximately 380 acres of early successional habitat in 23 two-aged harvests dispersed throughout the project area. The two-age harvests would range in size from 6 to 25 acres. This would remove closed canopy habitat needed by some wildlife species; however, habitat for species needing young stand characteristics would be created. Eight helicopter landings associated with some of the harvest units would create additional small openings. The open canopy conditions would last about 20 years, which is about the time it takes for the trees to reach about 1/3 the height of the scattered mature trees that would be remaining throughout the two-age harvest units. The two-aged harvests would eventually regenerate to mature stands dominated by shade-intolerant species, providing habitat for species that use hard mast and mature hardwood stands.

The proposed action would also include thinning four stands ranging in size from 9 to 78 acres and totaling 109 acres. The thinnings would remove lower quality trees and release healthy trees, predominantly mast producing trees such as oaks and hickories. Species requiring closed canopy forests may be affected by the thinnings in the short term, as the thinnings will create openings in the forest canopy. These openings may allow understory vegetation to flourish from the temporary increase of sunlight reaching the forest floor. A variety of wildlife species would capitalize on the new growth of understory vegetation. However, the thinnings would be rather light, leaving an abundance of healthy trees whose canopies would soon expand to fill the openings created by the thinnings. The thinnings would reduce competition for resources among overstory trees, most likely resulting in more vigorous trees and increased mast production, which would benefit a variety of wildlife species.

Salamanders could experience local population declines in the two-aged harvest units and possibly in the thinned stands. Pauley (1997) noted that in sections of clearcuts where sunlight reaches the soil, the surface is hardened and prevents salamanders from reaching the surface to feed. Where slash/surface litter is left and soils retain moisture, salamanders are still able to reach the surface. Although the proposed action does not include clearcuts, we presume that effects would be similar in areas of two-age and thinning harvests where the canopy has been opened. Pauley has also noted that in WV, red-backed salamanders will return to pre-clearcut populations within 22 years. Populations of mountain dusky salamanders will return and will be abundant, but will not equal pre-clearcut populations as quickly as the red-backed salamanders. Effects would be minimized by leaving all tree tops and other slash scattered through harvest units.

The proposed action includes several miles of road improvements, abandonment, construction and reconstruction (Table 2-2 in the EA). In general, the reconstruction of existing roads would have little effect on wildlife. Road reconstruction would result in the removal of vines, tree limbs, brush, and other vegetation that have encroached onto the roadways in the last several years. The reestablishment of the road corridor may benefit certain bat species that forage in linear openings on the National Forest. Road reconstruction would also remove any herbaceous vegetation that has grown on the road surface. Species such as deer, turkeys, grouse, cottontails, and songbirds would experience the loss of clover and other preferred plant species that presently occur on the roadway. However, these resources should still be available on the roadsides and other open areas. Eventually, herbaceous and woody vegetation would encroach upon the roadway again in the absence of active road maintenance.

The new road construction and the sections of road reconstruction that would occur outside of the existing road beds would result in the destruction or removal of linear strips of trees, other woody and herbaceous vegetation, topsoil, leaf litter and other organic material, and the wildlife species that had formerly utilized the affected resources. However, road abandonment would offset some of the new road construction. In time, the abandoned road and the relocated sections of roadway would be reclaimed by nature.

The herbicide application (up to 380 acres) included in this alternative would be conducted to inhibit striped maple and American beech competition in two-aged harvest units. The EPA approved herbicide "triclopyr" would be applied to individual trees by using either a backpack sprayer or a hatchet and squirt bottle. All treatments would follow label guidelines and would be supervised by a State-certified applicator. There would be no mechanized equipment or broadcast spraying used. Triclopyr, its metabolites, and the inert compounds associated with commercial herbicides containing Triclopyr have been shown to cause detrimental physiological, reproductive, carcinogenic, behavior, and survival effects in fish, frogs, ducks, chickens, dogs, mice, rats, rabbits, oysters, soil bacteria, and some arthropods, primarily in laboratory tests in which the animals were fed the chemical (Cox 2000). Triclopyr and its metabolites are also known to persist in the soil and to be mobile in the soil (Cox 2000), potentially affecting off-site organisms. However, given that the herbicide would be carefully applied only to individual trees and shrubs under the supervision of a State-certified applicator, mechanized equipment and broadcast spraying would not be employed in this project, the herbicide would not be used near water or in riparian zones, and the EPA has approved this pesticide for use in forestry applications, the risk of overexposure of animals to the herbicide is very small. Any effects on wildlife from the application of this herbicide would be expected to be minimal and short term.

Direct effects on birds could result from loss of eggs, nestlings and/or adults during tree-felling and skidding, primarily if these activities are conducted during the breeding season. Indirect effects could include loss of nests, nest cavity sites, and roosting sites. Bats roost under shredding bark of old trees and snags, so they could also experience loss of roosting sites and mortality during felling operations. Other cavity users, such as mice, squirrels, and raccoons, could be adversely affected by loss of cavities. These effects are minimized by guidelines in the Forest Plan which call for the retention of snags and den trees in thinning and other cutting units (Amendment 6, pages 86-86a).

Deer populations within this project area and adjoining areas have been gradually increasing over the past decades and this trend is expected to continue. In addition to consuming mast, deer browse on the twigs, buds, and leaves of many plant species. Contractors conducting botany surveys noted evidence of deer browsing on understory vegetation in the project area. The increasing deer population could eventually reach a level where it would reduce or eliminate understory vegetation, thus decreasing nesting sites and cover for songbirds and small mammals (DeCalesta 1994, McShea and Rappole 1994).

The two-aged harvests would result in abundant understory vegetation available for browse, nesting, and cover. In addition, slash left in regeneration harvests would afford some protection for the new understory vegetation from heavy deer browse, thus helping to retain more of this vegetation for multiple uses by other wildlife.

The thinning units would temporarily open the overstory canopy allowing sunlight to reach the forest floor. Understory vegetation would flourish, producing additional browse, forage, and

cover for deer and small animals. This vegetation would provide increased structural diversity that could attract songbirds such as hooded and Kentucky warblers (Smith 1988). Hawks, owls, and other predators that prefer a more open understory may have reduced hunting success in the dense understory vegetation. The skid roads needed to remove timber from the conventional harvest units may provide travel lanes for some species. Skid roads may temporarily isolate some small species such as salamanders that are associated with leaf litter and other forest floor organic matter, since their movements may be restricted by areas of bare soil.

Alternative B would provide for 380 acres of regeneration harvest (two-aged) where various species of oak regeneration would be emphasized. Some mature oaks and other species would be retained in each of the 23 two-aged units for mast production and to provide additional structural diversity and wildlife habitat. The residual trees remaining after the timber harvests would experience an increase in mast production on a per-tree basis, but the overall hard mast production of the affected stands would be reduced for several years. The stands created would provide mast in the future when some of the adjacent older stands may be declining in mast production. During the initial 10 to 15 years following harvesting, these sites would provide a varied food base of blackberry, forbs, woody vegetation, and grasses for a variety of animals, such as bears, turkeys, grouse, foxes, raccoons, chipmunks, deer, mice, and songbirds. Certain mast trees and shrubs, such as dogwood, hawthorn, and wild plum would have an increase in mast production after being released by the thinnings or two-age harvests, and would provide additional seasonal food sources.

Disturbance to Wildlife

The Proposed Action would involve conventional tree harvesting and skidding trees on 145 acres of the project area, harvesting and helicopter log extraction on 344 acres, and construction, reconstruction, improvement, and abandonment of several miles of roads (Tables 2-1 and 2-2). Direct and indirect disturbance to wildlife may occur during project implementation from (1) physical harm or mortality of individual animals from equipment use, tree felling, and skidding; (2) disturbance or destruction of nesting and roosting sites, cover vegetation, or food sources; (3) noise disturbance from equipment use and vehicle traffic; (4) visual disturbance from increased human activities in the area; and (5) soil disturbance and compaction during road construction and skidding.

Soil and ground disturbance from road construction could directly affect ground-nesting species by destroying ground nests and burrows, with possible loss of adults and young (salamanders, rabbits, mice, chipmunks, and ground-nesting birds such as juncos and ovenbirds). Soil compaction on roads, skid roads, and log landings would be detrimental for burrowing animals on those specific sites, but adjacent to the roads and landings would be largely unaffected by soil compaction. Tree-felling could directly affect some species, such as birds, bats, and squirrels if they were located in the tree at the time of felling. Noise from equipment and human activity could cause some species, such as bears and bobcats, to change their normal activity patterns to avoid some locations. Some animals may become roadkill victims due to the increase in log truck and other vehicle traffic in the project area during project activities.

Alternative C (Thinning Alternative): This alternative would have many of the same activities as Alternative B, only in a different form, intensity, or quantity. This alternative would result in 469 acres of thinnings in contrast to Alternative B's 109 acres of thinnings and 380 acres of two-aged harvests. Alternative C's thinnings would occur in 24 units ranging in size from 6 to 78

acres each. The yarding method for these thinnings would be conventional for 124 acres and helicopter for 345 acres. Road construction, reconstruction, improvement, and abandonment would be the same as in Alternative B.

Vegetation and wildlife responses to the thinnings in Alternative C would be similar to the responses expected for the thinning units in Alternative B, except that the effects would occur over four times as large an area. That is, the thinnings would temporarily open the overstory canopy allowing sunlight to reach the forest floor, which would cause a dense growth of understory vegetation. Residual mast producing species of trees and shrubs would probably produce more mast. Wildlife species favoring these conditions would benefit from these conditions and species that prefer closed canopy forests with little understory vegetation would decline. After several years, the remaining tree canopies would spread out, again blocking sunlight from reaching the forest floor. The understory vegetation would decline, causing a corresponding decline in wildlife species favoring dense understories. Species that prefer large expanses of early successional habitat, such as the two age stands in Alternative B would provide, would not be provided with their preferred habitat under Alternative C.

The thinnings proposed in this alternative would probably result in a temporary increase in mast production from the residual trees left in those units because of the increase in resources available to individual mast trees. However, since this alternative does not provide for regeneration of young mast producers (such as two-age harvests would provide), the mast crop would eventually begin to decline across the project area as the thinned stands reach overmaturity and there are no new stands to take their place. Species that benefit from or rely upon mast crops, such as squirrels, turkeys, bears, grouse, deer, blue jays, and others would probably decline in response to the decline in available mast.

Effects due to road construction, reconstruction, improvement, and abandonment would be the same as for Alternative B.

Cumulative Effects

Cumulative effects consist of effects of management activities in the project area combined with those on surrounding lands, and effects of various projects over time. The primary area considered for cumulative effects to wildlife is the Lower Clover project area, which is surrounded by a number of natural and man-made fragmenting features. These include the town of Parsons on the southeast; the community of St. George, the Cheat River, and State Highway 72 on the east; County Road 6 on the north; agricultural fields on the northwest; and the Right Fork of Clover Run, State Highway 38, County Road 17, Mill Run, and Smoky Hollow on the west and southwest. However, many of the activities that contribute to cumulative effects in the project area also occur throughout the Clover Run watershed vicinity, so much of the cumulative effects discussion could be considered applicable to this larger area.

As mentioned above, most of the Lower Clover project area was logged in the late 1800's and early 1900s during West Virginia's logging boom years, leaving the area as primarily a mosaic of even-aged stands ranging in age from 60 to 104 years old. Subsequent logging has taken place on National Forest and private lands in the project area over the last 50 years resulting in a variety of stand types and conditions depending upon the type and intensity of logging used. These past timber practices have largely determined the vegetation that presently occurs within the project area, and thus the habitats and the wildlife that are associated with those habitats. Other smaller scale natural and man-caused disturbances, such as wind throw, ice damage,

wildfires, and homesteading have had a lesser effect on the landscape, vegetation, and wildlife in the area.

Approximately 57% (5226 acres) of the Lower Clover project area is National Forest land and approximately 43% (3939 acres) is in private ownership. Logging has occurred on National Forest and private lands in the project area during the logging boom years and in the more recent past as described above. The condition of the forests and wildlife populations on private land is largely unknown. The historic logging practices have resulted in an uneven age class distribution and hi-graded stands in the project area. The National Forest lands in the area contain a paucity of young and very old stands and an abundance of even-aged sawtimber stands in the 61-105 year old age classes.

Currently, a large percentage of the forest in the project area is at the age where the trees typically reach their peak mast production. Wildlife species that use mast and mature second-growth forest are benefiting from the large volume of mast produced within the project area. However, mast production is probably not sustainable at its current level. As the trees within the project area continue to age, their mast production would eventually decrease. A balanced age class distribution in the project area would ensure that some stands in the project area are at their peak mast production years at all times so that the project area would provide a sustainable supply of mast for wildlife. Alternative B would help to balance age classes in the project area. If no new stands are regenerated, as would be the case with Alternatives A and C, then mast levels would probably continue to be high for a number of years, then drop off as mast trees approach senescence and oak, cherry, hickory, and other shade intolerant mast producers are gradually replaced by shade tolerant species. Game species such as deer, turkeys, bears, gray squirrel, and grouse that consume acorns and other mast would probably experience a corresponding reduction in their populations in the area.

Cumulative effects of fragmentation on wildlife, for any of the Alternatives (See Fragmentation Effects), are small. None of the proposed activities in the Alternatives would create any isolated woodlots. The post-management landscape would contain 2 to 25-acre openings in a mosaic of continuous forest canopy. Since timber production and wildlife species tolerant of disturbances are emphasized in this management prescription, the Forest Plan (P. 134) states that "there is no limit on the proportion of the opportunity area to be entered for timber practices during an entry cycle." The Lower Clover projects would affect zero acres under Alternative A, approximately 489 acres under Alternative B, and 469 acres under Alternative C. Therefore, Alternative B would affect approximately 5.3% of the total area and 9.4% of the National Forest lands within the project area. Alternative C would affect approximately 5.1% of the total area and 9.0% of the National Forest lands in the project area. The affected acreages in all of the alternatives would remain within the forest land base (except the new road locations), but would provide greater vegetation structural diversity within the project area, and thus greater habitat diversity for wildlife. Habitat for animals needing larger blocks of forested area would still be present in the sections of this OA not being managed at this time, and in adjacent land areas.

MP 3.0 does not provide for any "quiet time" between timber operations, so the current Forest Plan does not minimize disturbance to wildlife in that regard. However, timber operations in any given section of the OA are short term in nature and separated in space and time from other timber operations in the area, leaving a majority of the OA undisturbed by human activities at any given time. Forest Road 859 is presently closed year round and Forest Road 767 is presently

closed most of the year but opened part of the year during hunting season. None of the alternatives would include opening additional roads.

Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions that can affect wildlife habitat in the Lower Clover project area include activities such as timber harvests on Forest Service and private land, wildlife habitat improvements such as new permanent openings and waterholes, maintenance of existing Forest and state roads, construction of the Corridor H highway, maintenance and operation of existing gas wells and pipelines, construction of new gas wells, and possible residential and agricultural developments. In general, these activities tend to maintain or create permanent openings, early successional forest habitat, and edge habitat. These activities tend to reduce and fragment mature forest habitat. However, future timber harvests may help sustain mast production over the long term by maintaining shade-intolerant tree species as a component of future mature forests.

Alternative A – No Action – Contribution to Cumulative Effects

Alternative A would not involve any management activity in addition to ongoing activities and maintenance. Therefore, Alternative A would not contribute to the cumulative effects of past, present, and reasonably foreseeable future actions.

Alternative B – Proposed Action – Contribution to Cumulative Effects

The two-age harvests, new road construction, and new landings proposed in Alternative B would contribute to the cumulative effects of other actions that replace mature forest habitat with early successional forests, permanent openings, and edge. The two-age harvests would also contribute to the long-term maintenance of mast production in future mature forest habitat. The thinning harvests included in this alternative would not remove the forest canopy, and thus would not contribute to cumulative effects related to openings. However, thinning would stimulate understory growth and would make a very short-term contribution to some components of early successional and edge habitats. Most of this alternative's contribution to cumulative effects would last about 20 years, at which time canopy closure of the two-age harvest units would return these areas to forest habitat. However, the contribution of the new road and landings would persist indefinitely as long as these areas are maintained. The contribution to sustainable mast production would begin when the regenerated trees reach optimal mast production several decades after the harvest, and would continue until the trees begin to senesce around a century after the harvest.

Species that are limited to mature forests, such as forest interior birds and some salamanders, would experience population declines due to these cumulative effects. However, despite these effects, mature forests and the species that inhabit them are expected to continue to dominate the majority of the project area. No species is likely to be extirpated from the area due to these effects. Cumulative effects would be beneficial to species that use openings, edge, and early successional habitats for all or a portion of their habitat. Examples of such species include white-tailed deer, wild turkey, eastern towhee, and golden-winged warbler. Over the long term, cumulative effects would benefit mast-using species such as black bear, wild turkey, and white-tailed deer.

Alternative C – Thinning Only – Contribution to Cumulative Effects

The thinning harvests included in this alternative would not remove the forest canopy, and thus would not contribute to the cumulative effects of other actions that replace mature forest habitat with openings. However, thinning would make a very short-term contribution (a few years) to some characteristics of early successional forest and edge habitat. The new road and landings included in this alternative would make a very small contribution to such cumulative effects. This contribution to cumulative effects would persist as long as the new road and landings are maintained. This alternative would not regenerate shade-intolerant species, and thus would not contribute to cumulative effects of future regeneration harvest in maintaining long-term mast production. Species that are limited to mature forests, such as forest interior birds and some salamanders, would experience population declines due to these cumulative effects, although the contribution of this alternative to these declines would be very slight. Despite these effects, mature forests and the species that inhabit them are expected to continue to dominate the majority of the project area. No species is likely to be extirpated from the area due to these effects. Cumulative effects would be beneficial to species that use openings, edge, and early successional habitats for all or a portion of their habitat. Again, the contribution of this alternative to these beneficial effects would be very small.

MANAGEMENT INDICATOR SPECIES (MIS)

Nine terrestrial wildlife species are identified in the Forest Plan as Management Indicator Species. Three fish species, lumped under the category "wild trout," are also designated as MIS. Species identified represent important game species, T&E species and species inhabiting specific ecosystems.

Using a variety of techniques, the Forest has monitored MIS species and their habitat since 1986. Wildlife monitoring data collected, including changes in available habitat, are summarized in annual Forest and Fish and Wildlife Monitoring Reports. Information from these published reports, as well as on-going or unpublished monitoring data, is incorporated here by reference.

The following includes discussions of present habitat conditions for MIS within the project area. Population and habitat trends on the Forest and in the project area are also discussed where information is available.

White-tailed Deer (*Odocoileus virginianus*)- This species is an indicator of early-successional or regenerating deciduous habitat in combination with mature forests. Deer rely on a mosaic of forested and non-forested ecosystems providing cover and foraging habitat. Tree harvesting typically converts forested cover into early successional stages of vegetation that function as important foraging areas. However, overabundant deer densities preclude tree regeneration and over time alter tree species composition (Tilghman 1989). White-tailed deer are considered a "keystone" herbivore, capable of affecting the distribution and abundance of many other wildlife species, plant species and plant communities (Waller and Alverson 1997). Habitat in the project area is currently meeting white-tailed deer food, cover and water requirements. Deer or their sign were evident during every site visit to the project area in 2003-2004.

Approximately 8.6% of the project area consists of grassy openings of one type or another. Only approximately 0.5% of the National Forest lands in the project area is composed of developed and maintained wildlife openings where herbaceous forage availability for deer is

high. These existing openings (26 acres total) have been constructed over the past 20 years in association with timber management activities. Adjoining private lands contains pasture, agricultural fields, clearcuts, residential lawns, and other openings, totaling approximately 765 acres.

Much of the project area is currently capable of mast production, predominately by oak, black cherry, and beech. Historic large-scale disturbances in the late 19th and early 20th centuries (extensive logging, wildfires and chestnut blight) created an abundance of early successional habitat in a relatively compressed timeframe. Today, these areas have matured to 60 + year old stands that provide abundant mast. These stands provide year-round food for deer, but perhaps most importantly they provide mast for winter sustenance which can be a limiting factor for white-tailed deer in some areas.

According to the Forest Plan, population objectives for white-tailed deer in Management Prescription 3.0 is 50.5 deer/square mile in a mixed hardwood type (Forest Plan 1986, Appendix L). West Virginia Big Game Bulletins, a yearly publication of the WV Division of Natural Resources, tracks deer harvest numbers by county and National Forest wildlife management areas. Population estimates are based on the premise that the number of bucks harvested during the gun season represents 10% of the deer population in an area. The Lower Clover Opportunity Area (9,165 acres or 14.3 square miles) is located in the western portion of the Blackwater Wildlife Management Area (BWMA) (58,978 acres or 92.2 square miles). Estimated deer populations, based on harvest numbers (and with the assumption that deer are evenly distributed across the WMA), are shown in the table below.

Table 3-12. Estimated Deer Populations in BWMA

Blackwater Wildlife Management Area							
Year	1997	1998	1999	2000	2001	2002	2003
Buck Harvest	162	194	205	195	228	271	101
Est. population BWMA	1620	1940	2050	1950	2280	2710	1010
Est. deer Per sq. mi. in Lower Clover OA	17.6	21.0	22.2	21.1	24.7	29.4	11.0
Est. deer pop. In Lower Clover	252	300	318	302	353	420	157

Abundant mast production has kept deer populations in the area high by providing a food source during the most critical time of year. The steepness of the area provides protection for deer during the hunting seasons in remote locations since extraction of harvested deer from those sites would be too difficult for many hunters. Deer populations in the BWMA seemed

to reach a peak in 2002 followed by a severe population crash in 2003. Deer numbers crashed across much of the Monongahela National Forest in 2003. The reduction in the deer population was due to a combination of a failed mast crop and a severe 2002-2003 winter with deep snows and bitter temperatures. The low deer harvest in 2003 may have also been exacerbated by lower hunter effort because of the perceived lower deer population and unpleasant weather conditions that hunting season.

The current distribution of water in the project area is probably not limiting white-tailed deer use. Most of the project area is within ½ mile of permanent water sources. Intermittent streams throughout the project area provide water during wet seasons.

Black bear *(Ursus americanus)* – This species is an indicator of mature/late-successional forests and does best in oak/hickory or mixed mesophytic forests with an understory of blueberry, blackberry, raspberry, rhododendrom and mountain laurel. They feed primarily on grasses and forbs in the spring. Insects, blackberry, blueberry, pokeberry, serviceberry compose up to 60% of their diet during summer months. As fall approaches, black cherry and acorns are the preferred food (Eagle & Pelton 1983). All these foods are present in the project area. Bears and their sign were seen in the project area during site visits in 2003-2004.

Regenerated areas less than 15 years old are found within the project area and offer increased soft mast supplies during summer. Temporary and closed system roads, wildlife openings, and log landings provide soft mast and foraging habitat.

Thickets of grape and greenbrier also provide key feeding areas for black bear. These resources are available in some locations in the project area. Mid-successional and mid/late successional stands would provide shrubs and trees (dogwood, serviceberry, fire cherry) that produce soft mast. The two-age harvests and thinnings would release these dogwood and serviceberry if present in the understory and midstory and would increase their mast production. The two-age harvests may result in a luxurious growth of fire cherry in some areas under the right conditions. Mature hardwood stands provide important sources of year-round food, particularly fall and winter food such as acorns and nuts. Much of the project area provides this habitat.

The availability of bear den habitat appears to be sufficient in the project area. Rock outcrops and surface rocks are present that could accommodate a large animal such as a black bear. Elevated tree dens, uprooted root wads, and slash piles may also be used as den sites. Access management is thought to influence black bear movement. Road density may therefore be a limiting factor in the ability of an area to provide quality black bear habitat. Total project area road density currently is below the maximum recommended road density limit of 1.5 miles per square mile of local roads.

The Forest Plan population objectives for black bear in 3.0 management prescription is 0.6 bear/square mile or one bear every 1.7 square miles. A moderate number of bears is taken annually within Tucker County, the county within which the project area occurs, compared to other counties in the state. The total legal bear harvests reported from the county in 2001-2003 were 66, 72, and 72, respectively. In comparison, nearby Randolph County consistently has the highest bear harvest numbers, with the total number of bears harvested from 2001-2003 being 174, 191, and 222, respectively. Within the 10 counties that fall completely or partially within the MNF, bear harvests were lowest in nearby Barbour County

with harvests only at 17, 13, and 31 bears taken from 2001-2003, respectively.

Gray squirrel *(Sciurus carolinensis)*– This mature/late successional forest species is found in most woodland areas, especially oak, hickory and beech forests which provide food over a long season and an abundance of den and cavity trees. The Forest Plan population objective for gray squirrels in 3.0 management areas is 640 squirrels per square mile in a mixed hardwood/oak type ecosystem with 20-30% oak. The gray squirrel population objective in 3.0 areas in an oak-hickory type is 1726 squirrels per square mile. Since many of the stands in the project area have more than 30% oak but have a lower proportion of mast producing trees than pure oak-hickory stands, the squirrel population probably falls somewhere within the 640-1726 squirrels/square mile range. This rodent is the most popular game animal in West Virginia with annual harvests approaching 2 million. Although the WVDNR does not track yearly harvests of squirrels, annual population fluctuations are normal. These fluctuations typically occur in response to the abundance of hard mast the preceding year. Bumper mast crops result in squirrel population explosions and mast failures cause precipitous population crashes.

Wild Turkey *(Meleagris gallopavo)*– This species is typically associated with grassy openings, thickets of dense cover, scattered clumps of conifers and extensive tracts of mature/late-successional forests. Turkeys can be found throughout the project area.

Eastern wild turkey and their young use grass/forb habitat to forage for insects in the late spring and summer months. While acorns are the primary food of wild turkey in fall, winter, and into spring, their prominence in the diet declines to less than 5 % in summer (Dickson 1990). Insects, herbaceous material, and grass seed dominate the summer diet. The project area contains approximately 791 acres of open grass/forb habitat, or 8.6% of the OA, most of which occurs on private lands. Mature mixed hardwood forest types cover the majority of the project area on National Forest lands. Eastern wild turkeys eat a variety of plant and animal matter when it is available but important fall and winter foods are the fruits, seed, or nuts from wild grape, oaks, beech, ash, dogwood and black cherry. The project area provides mast in the form of acorns, beechnuts, and black cherry. Wild grape, ash, and flowering dogwood are locally common but are not abundant throughout the project area.

Dense regeneration thickets provide security cover during hunting seasons and shelter during other times of year. The project area also contains conifers that provide roost cover during severe winter weather. Turkeys need a daily water source and water is available at various locations within the project area in the form of perennial and ephemeral streams and man-made waterholes.

The population objective for turkeys in this 3.0 management area is 31.7 turkeys/square mile in the mixed hardwood and oak-hickory types. The WVDNR tracks spring and fall turkey harvest numbers by county and National Forest wildlife management area and reports those figures in their annual Big Game Bulletins. Population estimates are based on the premise that the number of spring gobblers harvested represents 10% of the turkey population in an area. The Lower Clover Opportunity Area (9,165 acres or 14.3 square miles) is located in the western portion of the Blackwater Wildlife Management Area (BWMA) (58,978 acres or 92.2 square miles). Estimated turkey populations, based on harvest numbers (and with the assumption that turkeys are evenly distributed across the WMA), are shown in the table below.

Table 3-13. Estimated Turkey Populations in BWMA

Blackwater Wildlife Management Area							
Year	1997	1998	1999	2000	2001	2002	2003
Spring Gobbler Harvest	63	58	65	62	103	27	22
Est. population BMWA	630	580	650	620	1030	270	220
Est. turkeys Per sq. mi. in Lower Clover OA	6.8	6.3	7.0	6.7	11.2	2.9	2.4
Est. turkey pop. in Lower Clover	97	90	100	96	160	41	34

According the the WVDNR, the suspected reasons for the tremendous decline in the number of birds harvested statewide in the spring of 2002 were not due to an actual reduction in the turkey population but were due to (1) the adverse weather conditions during the hunting season that affected hunter participation and success, (2) fewer naive young gobblers in the population that are easier to kill, and (3) gobblers were more difficult to call in because of male-female social interactions that year (WVDNR 2002). In contrast, the continued harvest rate decline in the spring of 2003 is expected to reflect a decline in the turkey population in some areas due to the severe winter weather that killed many birds. The spring 2003 harvest rate decline was probably also exacerbated by the poor weather during the spring gobbler season that may have reduced hunter participation (WVDNR 2003).

Indiana bat *(Myotis sodalis)* – The Indiana bat occupies 26 known hibernacula in West Virginia (Forest BA). Population objectives in the Recovery Plan are two-fold based on hibernaculum priority. Priority Two hibernacula (found in WV) recovery objectives includes those for Priority One hibernacula as well as protection and documentation of stable or increasing populations for three consecutive census periods at 50% of the Priority Two hibernacula in each state, with the overall population level being restored to the bat population in 1980. A revised draft recovery plan has been written.

Mistnetting efforts were conducted in the project area in 2003 by experienced, professional bat biologists to determine if Indiana bats occur in the project area. Although several other bat species were captured, no Indiana bats were located (SEI 2003). In 2001, a male Indiana bat was captured and radio tracked on the Fernow Experimental Forest approximately 2.9 miles south of the southern tip of the project area (Ford et al. 2002). In July 2004, contractors for the Forest Service captured a lactating female and confirmed the existence of a maternity colony in the Lower Glady area, approximately 8.5 miles southeast of the Lower Clover project area.

There are no caves in the project area that are known to be used by Indiana bats. However, one cave that acts as a hibernaculum for Indiana bats does occur within five miles of the southern portion of the project area. Indiana bats have been found to use habitat as far as 5 miles from a hibernacula for swarming areas. Some males can remain near the hibernacula year-round (Stihler 1996). The portion of the project area within the five-mile radius has been assigned to MP 6.3 by the recent threatened and endangered species amendment to the forest plan. Within this MP, vegetation greater than 5 inches dbh may be managed only for the benefit of the Indiana bat, for other threatened and endangered species habitat, for maintenance or enhancement of natural vegetative communities, or for public safety (Forest Plan amendment 6, page 190b). In Alternative B, only one unit that has been proposed for harvesting activities in this entry occurs partially within the 5 mile radius around the hibernaculum. The timber unit that falls partially within the 5 mile radius of the cave is comprised of portions of Stands 61 and 62 in Compartment 20, near Forest Road 859A Stand 62 just touches the boundary of MP 6.3, and the very small portion within MP 6.3 (0.2 acres) likely is within the margin of error of the GIS map layers depicting these features. These units are proposed to be harvested as two-age regeneration with timber removal accomplished by helicopter. Under Alternative C, no timber harvest unit would occur within the 5 mile radius of the hibernaculum, as Stand 61 would not be included in the timber activities proposed under that alternative.

As of the summer of 2004, no maternity colonies had been found nearer than 8.5 miles from the project area. However, potential habitat exists within the project area. Stands of mixed hardwoods greater than 70 years old (87% of the Project Area) could provide maternity and foraging habitats.

Virginia big-eared *(Corynorhinus townsendii virginianus)* – In West Virginia, 10 caves are known colony sites for VBEB. The criteria needed to downlist this species to threatened are: (1) documentation of long-term protection of 95% of all known active colony sites, and (2) documentation of stable or increasing populations at 95% of known active maternity sites and hibernacula for a 5 year period. Research by C. Stihler of the WVDNR has shown that VBEB forage within 6 miles of hibernacula. There are no known Virginia big-eared bat hibernacula or maternity caves within the project area. However, the same cave that acts as a hibernaculum for Indiana bats within 5 miles of the southern tip of the project area also supports VBEB. Under both Alternatives B and C, proposed timber harvest units in Compartment 20 fall within the 6 mile radius circle aroud the VBEB cave. In Alternative B, all or portions of four harvest units (five stands) fall within the 6 mile radius. All of these timber units would be harvested as two-age stands. In Alternative C, four units within the 6-mile radius would be thinned.

Cheat Mountain salamander *(Plethodon nettingi)* – This small woodland salamander is found in red spruce and mixed deciduous forests above 2,700 feet in elevation in microhabitats that have relatively high humidity, moist soils, and cool temperatures. The recovery objective is to remove the salamander from the list of federally endangered and threatened species. Moving towards that end, recovery objectives listed in the Recovery Plan include: (1) Monitoring of ten populaitons over a period of ten years shows them to be stable or expanding, (2) 100 populations distibuted throughout its range are in protected ownership, (3) sufficient life history information exists to assure appropriate management as needed, and (4) monitoring and management programs are implemented on a continuing basis.

There is no known Cheat Mountain salamander habitat within the project area.

West Virginia northern flying squirrel *(Glaucomys sabrinus fuscus)*– The preferred habitat of the WVNFS is conifer/northern hardwood ecotones or mosaics in the central Appalachians consisting of red spruce and fir associated with beech, yellow birch, sugar maple/red maple, hemlock and black cherry (USFWS 1990). The project area does not contain WVNFS habitat. The recovery objective is to remove the squirrel from the list of endangered and threatened species. Moving towards that end, recovery objectives listed in the Recovery Plan include: (1) Squirrel populations are stable or expanding in a minimum of 80% of all geographic recovery areas designated for the subspecies, (2) sufficient ecological data and timber management data have been accumulated to assure future protection and management, and (3) Geographic recovery areas are managed in perpetuity to ensure that sufficient habitat for population maintenance/expansion exists, including habitat corridors between populations to permit migration among areas.

There area no known locations of WVNFS within the project area.

Snowshoe (varying) hare *(Lepus americanus)*-This species occurs in second-growth beech/birch/maple forests and in young spruce stands, both with dense rhododendrom cover. They are indicators of an early successional component in high elevation hardwood/conifer ecosystems. They feed primarily on beech, birch, blueberry, brambles, grasses, hemlock, highbush cranberry, maples, red spruce, rhododendron, and serviceberry. In the winter when snow is deep, they are forced to prune higher branches. Forest Plan population objectives for snowshoe hare in MP 3.0 areas are 54 hares/square mile in a mixed hardwood type with spruce and 0 hares/square mile in an oak-hickory type. Snowshoe hares occur within the BWMA at higher elevations. However, spruce and rhododendron are not common in the project area, and snowshoe hares are not known to occur there. The snowshoe hare is a regulated small game species in West Virginia with a daily bag limit of 2 during the rabbit and hare season; however, the WVDNR does not track annual harvest numbers. The Forest is currently working with the Northeastern Forest Experiment Station in Parsons, WV to develop a monitoring plan for snowshoe hare.

Wild Trout – See analysis in Aquatic Resources section.

Direct and Indirect Effects of Alternatives

Direct and indirect effects of Alternative A – No Action: This is a "status quo" strategy that allows only current administrative activities and policies. However, the effects described herein take into account the ecosystem changes that would occur over time even in the absence of active management.

For the near future, the project area would remain as a primarily even-aged forest made up of a wide variety of species of flora and fauna. Current routine maintenance of roads, trails, and wildlife openings would continue, but no timber regeneration or thinning treatments would occur. No roads would be constructed, reconstructed, or abandoned. No additional early successional habitat would be created by management activities. Natural events such as windthrow would still occur and may open small areas, creating short-term openings with dense herbaceous and woody plant cover, but little grassy cover. Edge conditions provided by previously created clearcuts and two-aged harvest units in the project area would gradually decrease over time. The current level of fragmentation would remain for the near term, but

fragmentation would decline over time as previous harvest units mature. Permanent fragmentation caused by roads, agricultural land, residential sites, etc. would persist. Late successional habitat would increase and older growth conditions would become more common.

In the mid term, as individual mature mast-producing shade-intolerant species such as oak die from disease, windthrow, lightning strikes, or other causes, the shade tolerant species such as maples that presently occur in the midstory and understory would be released. This would create a more diverse forest, but one that produces less mast for wildlife.

In the long term with the absence of severe wildfires or widespread forest tree disease outbreaks, the forests in the area would become increasingly dominated by shade tolerant species such as sugar maple. Mast production in the area would decline, accompanied by a decline in mast dependent wildlife species such as deer, bears, turkeys, grouse, squirrels, and small mammals. In areas where disease, wildfire, tornado, or other catastrophic events should happen, shade intolerant species such as oak, hickory, and cherry may again take hold if they are not outcompeted by advanced regeneration of shade tolerant seedlings and saplings.

White-tailed deer – There would be no direct effect to white-tailed deer because of Alternative A in the short term. The project area would continue to meet food, cover, and water requirements for the white-tailed deer. Within the next several years, the woody vegetation in the existing two-aged stands and clearcuts in the project area would advance successsionally from the sapling stage to pole-sized trees, reducing browse habitat. Deer would rely more heavily on understory browse in older forested stands to satisfy their needs as no new seedling and sapling habitat will be created. In the long term, with the conversion from stands dominated by mast producing shade intolerant species to shade tolerant species such as maples, mast production in the area would decline causing a corresponding decline in deer numbers.

Black bear – There would be no direct effect to black bear because of Alternative A in the short term. The project area would continue to meet black bear food and water needs. Over the next 50-100 years as additional stands mature, the project area would offer better opportunities for tree denning and hard mast foraging. Black bear may find habitat conditions approaching optimal as the area develops greater amounts of larger diameter live and dead, standing and downed wood habitat. In the long term, however, shade intolerant mast producing species would decrease, reducing food supplies.

Gray squirrel – There would be no direct effect to gray squirrels with Alternative A in the short term. The project area would continue to meet food, cover and water requirements for this species. Over the next 50 or so years, the young stands in the project area would mature, providing additional habitat for this arboreal species. In the mid term, stands that are presently mature and at their peak of mast production would experience a decline in mast production as they reach senescence, reducing food supplies for squirrels in those stands. Over the long term, as shade intolerant mast trees are replaced by shade tolerant species, the mast productivity of the area would decline, thus causing a reduction in gray squirrel populations.

Wild turkey – As with the other MIS species that utilize mast, there would be no direct effect to wild turkey populations with this alternative in the short term. The project area would continue to meet food, cover, and water requirements for wild turkeys. As stands mature through time, hard mast habitat would increase temporarily in some stands, but then decline over the project area as shade intolerant species replace oak trees. No additional openings would be created so no additonal acreage would be available as brood rearing areas. The current conifer component

within the project area would probably remain stable, so there would probably be no change in thermal cover available for turkeys in the winter. Turkey populations would be expected to decline over time with this alternative.

Indiana bat – See effects discussion in the Threatened, Endangered, and Sensitive Species section.

Virginia big-eared bat - See effects discussion in the Threatened, Endangered, and Sensitive Species section.

Cheat Mountain salamander- There would be no direct effect to the Cheat Mountain salamander with Alternative A.

West Virginia northern flying squirrel - There would be no direct effect to the West Virginia northern flying squirrel with Alternative A.

Snowshoe hare - There would be no direct effect to Snowshoe hare with Alternative A.

Wild trout – See analysis in Aquatic Resources section.

Direct and indirect effects of Alternative B – Proposed Action

This alternative proposes two-aged timber harvests, thinnings, and road work in the project area.

White-tailed Deer and Black Bear– Implementation of Alternative B would not directly affect deer or bears in the area. Indirect effects via habitat modification would occur.

The road construction, reconstruction, improvement, and abandonment activities proposed in this alternative would cause some short term disturbance but the grass and forbs that would become established after these activities would provide some much needed habitat variety.

The timber harvests proposed in Alternative B would create additional early successional habitat and thus would provide additional forage for deer and soft mast for bears in those areas. Bear and deer would also use the two-age stands for cover after the vegetation becomes sufficiently dense. The harvested stands would experience a reduction in hard mast production in the short term, and this would affect fall and winter food supplies for bear and deer in those stands. In the long term, the improved age class distribution in this alternative and the regeneration in the two-age stands would provide for more stable mast production across the project area.

Gray Squirrel –Any direct effects to gray squirrels would be short-term and may involve some individual mortality during logging if tree felling occurs during the nesting season. Adult squirrels would most likely flee from timber harvesting equipment, but non-mobile young may not be able to escape. Indirectly, timber harvest activities in this alternative would decrease mast production and squirrel mobility in the short term since many mast trees would be removed and the remaining trees would be widely spaced. In the long term, the improved age class distribution provided by this alternative and subsequent entries would provide stable mast production across the project area and would benefit this species. The retention of snags and cull trees in harvest areas, as proposed in this alternative, would maintain nesting opportunities for gray squirrels.

Wild Turkey –Turkeys would not be directly affected by the activities proposed in Alternative B. Timber harvests would result in increased brood rearing habitat and dense cover for turkeys, while at the same time reducing mast production in affected areas in the short term. Turkey populations may be limited by the availability of brood range in forested areas where pastures

and crop fields are not common. Wild turkey poults depend on insects, spiders, and other invertebrates during the first month of life. These protein-packed foods are most abundant in openings. This alternative would not increase or decrease the amount of herbaceous openings in the project area, and so it would not change the amount of this habitat type available to turkeys. The road construction, reconstruction, improvement, and abandonment activities proposed in this alternative would cause some short term disturbance but the grass and forbs that would become established after these activities would provide some much needed habitat variety.

Indiana Bat – See effects discussion in the Threatened, Endangered, and Sensitive Species section.

Virginia big-eared bat – See effects discussion in the Threatened, Endangered, and Sensitive Species section.

Cheat Mountain salamander – The CMS does not occur in the project area, so Alternative B would not affect this species.

West Virginia northern flying squirrel – The WVNFS does not occur in the project area, so Alternative B would not affect this species.

Snowshoe hare – The snowshoe hare is not known to occur in the project area, so Alternative C would not affect this species.

Wild trout – See analysis in Aquatic Resources section.

Direct and indirect effects of Alternative C

This alternative was developed to address requests received from the public to develop an alternative that includes no regeneration harvests because of concerns about perceived visual quality and fragmentation effects that Alternative B would cause. Alternative C includes thinning several stands as well as a number of road management activities.

White-tailed Deer– Implementation of Alternative C would not directly affect deer in the area. The thinnings proposed under this alternative would provide additional forage for a few years after thinnings occur as the released understory plants increase their growth in response to the increase in sunlight reaching the forest floor. Mast production may be temporarily reduced because of the removal of individual mast trees from the canopy. The overstory canopies would increase their volume in response to the thinnings and would shade out the understory plants after about 10-15 years, again reducing forage available for deer in those stands. After a few years, the remaining trees in the thinned stands would be more vigorous than they would have been before the thinnings because of the increased availability of sunlight and nutrients. This would result in increased mast output, which would benefit deer in the fall and winter. However, this alternative would include no regeneration harvests. As with Alternative A, this alternative would result in a gradual species composition change to more shade tolerant non-mast producing species. This would result in a reduction in understory forage and mast available for deer, and would result in a reduction in the deer population across the study area.

The road construction, reconstruction, improvement, and abandonment activities proposed in this alternative would cause some short term disturbance but the grass and forbs that would become established after these activities would provide an additional food source for deer.

Black Bears—Implementation of Alternative C would not directly affect bears in the area. The thinnings proposed under this alternative would temporarily release grasses, forbs, and soft mast

producing trees and shrubs thereby increasing seasonal food sources for bears. Hard mast production may be temporarily reduced because of the removal of individual mast trees from the canopy. The overstory canopies would increase their volume in response to the thinnings and would shade out the understory and midstory plants after about 10-15 years, again reducing grass, forb, and soft mast production in those stands. After a few years, the remaining trees in the thinned stands would be more vigorous than they would have been before the thinnings because the increased availability of sunlight and nutrients. This would result in increased mast output, which would benefit bears in the fall and winter. However, this alternative would include no regeneration harvests. As with Alternative A, this alternative would result in a gradual species composition change to more shade tolerant non-mast producing species. This would result in a reduction in understory forage and mast available for bears, and would result in a reduction in the bear population across the study area.

The road construction, reconstruction, improvement, and abandonment activities proposed in this alternative would cause some short term disturbance but the grass and forbs that would become established after these activities would provide an additional food source for bears.

Gray Squirrel –Any direct effects to gray squirrels would be short-term and may involve some individual mortality during logging if tree felling occurs during the nesting season. Adult squirrels would most likely flee from timber harvesting equipment, but non-mobile young may not be able to escape. The probability of direct effects would be less in this alternative than in Alternative B because of the reduced number of trees removed and the smaller average sizes of trees removed in Alternative C. Indirectly, timber harvest activities in this alternative may decrease mast production somewhat in the short term since some mast trees would be removed. After about 10-15 years, the remaining trees in the thinned stands would be more vigorous and would have increased mast production, benefiting squirrels. However, in the long term, this alternative would result in a gradual tree species composition change to more shade tolerant non-mast producing species. This would result in a reduction in the amount of mast available for squirrels, and would result in a reduction in the squirrel population across the study area. Under this thinning alternative, gray squirrel mobility within the canopy would not be greatly affected since sufficient canopy cover would still be present to allow squirrels to jump from tree to tree. The retention of snags and cull trees in harvest areas, as proposed in this alternative, would maintain nesting opportunities for gray squirrels.

Wild Turkey –Turkeys would not be directly affected by the activities proposed in Alternative C. The thinnings proposed under this alternative would result in a temporary increase in the availability of brood rearing habitat and dense cover for turkeys, while at the same time resulting in a small reduction in mast production in the affected areas. After about 10-15 years, the remaining trees in the thinned stands would be more vigorous and would have increased mast production, benefiting turkeys. However, in the long term, this alternative would result in a gradual tree species composition change to more shade tolerant non-mast producing species. This would result in a reduction in the amount of mast available for turkeys, and would result in a reduction in the turkey population across the study area. This alternative would not include any regeneration harvests, so the longer persisting early successional habitat offered by that harvest type would not be available under this alternative. This alternative would not increase or decrease the amount of herbaceous openings in the project area, and so it would not change the amount of that habitat type available to turkeys. The road construction, reconstruction,

improvement, and abandonment activities proposed in this alternative would cause some short term disturbance but the grass and forbs that would become established after these activities are completed would provide some habitat variety.

Indiana Bat – See effects discussion in the Threatened, Endangered, and Sensitive Species section.

Virginia big-eared bat – See effects discussion in the Threatened, Endangered, and Sensitive Species section.

Cheat Mountain salamander – The CMS does not occur in the project area, so Alternative C would not affect this species.

West Virginia northern flying squirrel – The WVNFS does not occur in the project area, so Alternative C would not affect this species.

Snowshoe hare –The snowshoe hare is not known to occur in the project area, so Alternative C would not affect this species.

Wild trout – See analysis in Aquatic Resources section.

Cumulative Effects

The cumulative effects theme outlined above for general wildlife also applies to management indicator species. Past, present, and reasonably foreseeable future actions such as timber harvests, wildlife habitat improvements, highway construction, etc. are expected to create permanent openings, early successional forest habitat, and edge habitat, while reducing and fragmenting mature forest habitat. However, future timber harvests may help sustain mast production over the long term by maintaining shade-intolerant tree species as a component of future mature forests. Despite these cumulative effects, mature forests and the species that use them are expected to continue to dominate the landscape in the project area.

Alternative A Contribution to Cumulative Effects on MIS

Alternative A would not involve any management activity in addition to ongoing activities and maintenance. Therefore, Alternative A would not contribute to the cumulative effects of past, present, and reasonably foreseeable future actions.

Alternative B Contribution to Cumulative Effects on MIS

The two-age harvests, new road construction, and new landings proposed in Alternative B would contribute to the cumulative effects of other actions that replace mature forest habitat with early successional forests, permanent openings, and edge. The two-age harvests would also contribute to the long-term maintenance of mast production in future mature forest habitat. The thinning harvests included in this alternative would not remove the forest canopy, and thus would not contribute to the cumulative effects of openings, but would make a very short-term (a few years) contribution to some characteristics of early succesional forest and edge habitat. Most of this alternative's contribution to cumulative effects would last about 20 years, at which time canopy closure of the two-age harvest units would return these units to forest habitat. However, the contribution of the new road and landings would persist indefinitely as long as these areas are maintained. The contribution to sustainable mast production would begin when the regenerated trees reach optimal mast production several decades after the harvest, and would continue until the trees begin to senesce around a century after the harvest.

These cumulative effects likely would maintain or increase populations of MIS that use openings and early successional areas for all or a portion of their habitat requirements. These MIS include white-tailed deer, black bear, and wild turkey. MIS that use mast would benefit from the sustainable mast production provided by these cumulative effects. These MIS include white-tailed deer, wild turkey, black bear and gray squirrel. All of the preceding MIS also use mature forested habitats, but the loss of some of this habitat due to cumulative effects is likely to be offset by the beneficial effects of more browse, more brood-rearing habitat, and sustained mast production.

Alternative B would have not contribute to any cumulative effects on Cheat Mountain salamander, West Virginia northern flying squirrel, and snowshoe hare, due to a lack of habitat for these species in the project area. See the analysis in the Aquatic Resources section for effects on wild trout. Cumulative effects to Indiana bat and Virginia big-eared bat are analyzed in the Threatened, Endangered, and Sensitive Species section.

Alternative C Contribution to Cumulative Effects on MIS

The thinning harvests included in this alternative would not remove the forest canopy, and thus would not contribute to the cumulative effects of other actions that replace mature forest habitat with openings. The new road and landings included in this alternative would make a very small contribution to such cumulative effects. The contribution to cumulative effects would persist as long as the new road and landings are maintained. Thinning would make a very short-term contribution to some characteristics of early successional forest and edge habitats. This alternative would not regenerate shade-intolerant species, and thus would not contribute to cumulative effects of future regeneration harvest in maintaining long-term mast production.

Alternative C would make a small contribution to beneficial cumulative effects on MIS that use openings and early successional habitat for all or a portion of their habitat requirements. These MIS include white-tailed deer, black bear, and wild turkey. These MIS also use mature forested habitats, but the loss of some of this habitat due to cumulative effects is likely to be offset by the beneficial effects of more browse and brood rearing habitat.

Alternative C would not contribute to any cumulative effects on Cheat Mountain salamander, West Virginia northern flying squirrel, and snowshoe hare, due to a lack of habitat for these species in the project area. See the analysis in the Aquatic Resources section for effects on wild trout. Cumulative effects to Indiana bat and Virginia big-eared bat are analyzed in the Threatened, Endangered, and Sensitive Species section.

FRAGMENTATION ANALYSIS – TO BE COMPLETED

RARE AND ECOLOGICAL IMPORTANT SPECIES

An additional goal of ecosystem management is to protect rare and ecologically important species. “Species with naturally limited ranges or those facing extinction (including species not formally listed under the Endangered Species Act or recommended by the state) clearly require special attention. Similarly, the loss of certain ‘keystone’ species – species that provide important food, habitat, or other ecological values that would affect a large number of other species can affect overall ecosystem structure and function” (CEQ 1993). The Forest Plan (page 84) states that “management will protect or enhance habitat for threatened and endangered species and consider the needs of species identified as special or unique.

THREATENED, ENDANGERED AND SENSITIVE SPECIES

A biological assessment (BA) and a biological evaluation (BE) were completed to determine the effects of the projects in the Proposed Action and alternatives on federally listed and proposed threatened and endangered species and Regional Forester Sensitive Species that have been identified as having at least part of their range on the Monongahela National Forest (USDA Forest Service – Memo, Technical Update R9 Sensitive Species List). This effects section summarizes the data in the BE.

Also considered was the programmatic Biological Assessment for the Monongahela National Forest Plan (USFS 2001), the corresponding Biological Opinion from the U.S. Fish and Wildlife Service (USFWS 2002), and the recently approved Forest Plan Amendment for T&E species on the MNF. All alternatives comply with the Terms and Conditions, the Incidental Take Statement, and other components of the Biological Opinion.

Determination was made as to the Likelihood of Occurrence (LOO) of each of the TES species and their potential habitat in the Lower Clover Project Area. This was based on habitat requirements, district TES species files, records from the Natural Heritage Section of the West Virginia Division of Natural Resources (WVDNR), available research literature, various field surveys, and personal communication with TES species specialists. The potential effects of each alternative on those species and their habitats were evaluated.

Endangered and Threatened Species

The programmatic Biological Assessment (BA) for the Monongahela National Forest (USFS 2001) lists the following nine federally listed species as occurring on the MNF. Those species are the Virginia big-eared bat (*Corynorhinus townsendii virginianus*), Indiana bat (*Myotis sodalis*), West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*), bald eagle (*Haliaeetus leucocephalus*), Cheat Mountain salamander (*Plethodon nettingi nettingi*), shale barren rock cress (*Arabis serotina*), Virginia spiraea (*Spiraea virginiana*), running buffalo clover (*Trifolium stoloniferum*), and small-whorled pogonia (*Isotria medeoloides*).

The programmatic BA (USFS 2001) concluded that for all threatened and endangered species found on the MNF, with the exception of the Indiana bat, the continued implementation of the Forest Plan, including timber harvests and road construction, would result in a "no effect" or "may affect, not likely to adversely affect" condition for these species. The programmatic BA further concluded that continued implementation of the Forest Plan would result in a "may affect, likely to adversely affect" determination for the Indiana bat for all activities that involve tree cutting.

Conclusions drawn from the LOO table dictate the level of analysis needed for each threatened or endangered species. No threatened or endangered species are known to occur within the project area. The proposed projects would have no effect on the following listed species because of a lack of known occurrences of these species and potential habitat within sites proposed for projects: bald eagle, West Virginia northern flying squirrel, Cheat Mountain salamander, running buffalo clover, Small whorled pogonia, Virginia spiraea, and shale barren rock cress. These species were not analyzed further. The Indiana bat and the Virginia big-eared bat are not known to occur in the Lower Clover project area; however because of the proximity of a hibernaculum used by these species to the southern tip of the project area and the possibility for habitat for these species to occur within the project area, they have been evaluated below.

Indiana Bat

The Indiana bat is distributed throughout eastern US, from Oklahoma, Iowa, and Wisconsin, east to Vermont and south to northwestern Florida (Romme et al. 1995). During winter, Indiana bats restrict themselves primarily to karst areas of east-central U.S. During summer, Indiana bats forage nightly for terrestrial moths and aquatic insects in riparian as well as upland forests.

Hibernacula

Indiana bats typically hibernate predominately in karst caves from October - April, depending upon local weather conditions. In the last decade, WV has seen a 45% increase in the number of hibernating Indiana bats (Wallace pers. comm. 1999) with total populations across WV at approximately 10,658 (Stihler and Wallace 1999).

Hibernacula Habitat in and around the MNF and Lower Clover Area

In most years, approximately 26 West Virginia caves provide adequate Indiana bat winter hibernacula. Eleven hibernacula, including Hellhole, are within the MNF Proclamation Boundary, but only 3 (Big Springs Cave, Cave Hollow/Arbogast Cave, and Two-Lick Run Cave) have all or most of their entrances on MNF land. Big Springs Cave, located approximately 4 miles from Lower Clover analysis area, is nearest Indiana bat hibernaculum. It is gated and closed to entry from September 1 to May 15. The most recent 2003 winter cave survey tallied 199 Indiana bats using Big Springs cave. This is a decline from 240 bats counted during the 2000 winter survey.

Direct, Indirect and Cumulative Effects to Hibernacula habitat

Any Activity proposed in Lower Clover analysis area would have no direct, indirect or cumulative affect on Big Springs cave or any bats occupying that cave. Winter hibernacula habitat for Indiana bats is not analyzed further.

Summer Maternity Sites and Bachelor Habitat

Female Indiana bats depart hibernation caves before males and arrive at summer maternity roosts in mid-May. Females form small maternity colonies containing up to 100 adults and their young. A single offspring, born during June, is raised at this maternity site usually under loose tree bark (Harvey et al. 1999). Maternity colonies typically use multiple roosts – at least 1 primary roost used by most bats during summer, and a number of secondary roosts used intermittently and by fewer bats. Thus, some Indiana bat maternity colonies may use more than a dozen roosts (USFWS 1996).

Romme et al. (1995) presents five variables that determine roosting habitat (percent canopy cover, mean diameter of over-story trees, density of potential live roost trees >8.7 inches DBH, density of snags >8.7 inches DBH, and percent understory [or understory crown density]) and describes the values of these variables which make the most suitable Indiana bat habitat. The optimal canopy cover for roosting Indiana bats is 60-80%. The higher the mean diameter of over-story trees, the more suitable the area is for roosting. The abundance of snags indicates current roosting value, so the more snags the better. The percent of understory cover indicates how accessible the roost trees are to the bats, the lower percentage, the better access to roost sites. Tree structure, specifically the availability of exfoliating bark with roost space underneath, is a critical characteristic for roost trees.

Identified Summer Maternity and Bachelor Habitat on the MNF and Lower Clover Area

West Virginia is within Indiana bat's eastern maternity range, but not within the core range. The first confirmed capture of a lactating female Indiana bat was in the Lower Glady area on 7/12/04. This capture is approximately 8.5 miles from Lower Clover analysis area. This capture indicated the presence of an Indiana bat maternity colony. A radio transmitter was placed on the female bat and roosting habits were documented through monitoring efforts until the transmitter fell off the bat. Evening emergence counts were conducted at 2 identified roost sites. Both roost sites were either on or very near Forest Service lands and within ½ mile from the original capture site. Emergence counts of approximately 5 bats at one roost tree and 20 bats at a second roost tree were indicators of the maternity colony presence. Protections as provided in the Forest Plan have been implemented with regard to this maternity roost site. The two-mile radius area of influence for this maternity site falls well outside of the Lower Clover project area boundary. Mistnetting for bats was conducted within the project area in 1999 and 2003 by experienced bat biologists in attempts to capture Indiana bats in the area. Although several other species of bats were captured, no Indiana bats were recorded during either survey session (SEI 2003).

Direct, Indirect and Cumulative Effects to Summer Maternity Sites and Bachelor Habitat

The July 2004 maternity colony is nested within the existing Area of Influence (5-mile primary range) for the Cave Hollow-Arbogast Cave. The Lower Clover project area lies approximately 6.5 miles from the maternity buffer.

Any Activity proposed in Lower Clover analysis area would have no direct, indirect or cumulative affect on the known maternity site within the Cave Hollow/Arbogast maternity site. Summer maternity sites and bachelor habitat for Indiana bats is not analyzed further.

Summer Foraging and Roosting Habitat

Indiana bats forage nightly for terrestrial moths and aquatic insects, primarily in upland forests and riparian woodlands usually between May and October. Prey selection reflects the available foraging environment (Romme et al. 1995). While summer needs are not well understood (USFWS 1997), Indiana bats prefer to forage within upper forest canopy layers where over-story canopy cover ranges from 50-70% (Romme et al. 1995). Indiana bats are known to forage along forest edges, in early successional areas, and along strips of trees extending into more open habitat, but drinking water must be available near foraging areas (Romme et. al. 1995). Large open pastures or croplands, large areas with <10% canopy cover, and stands with large unbroken expanses of young (2-5-in dbh), even-aged forests are avoided or are rarely used for Indiana bat foraging (Romme et al. 1995).

Summer Foraging in and around the MNF and Lower Clover Area

Potential roosting habitat, both maternity and non-maternity, is widely available as the MNF is 96% forested (872,800 acres) with 63% of that (549,860 acres) being >60 years old. Based upon a review of available forest data, a large amount of the Forest is above optimal canopy closure for Indiana bat foraging habitat, but the majority of forested conditions make most of the Forest potential habitat. Trees exhibiting roosting characteristics, such as shagbark and bitternut hickory, red and white oak, sugar maple, white and green ash, and sassafras, are plentiful throughout the Forest.

The southern end of the Lower Clover project area lies within the 5-mile radius primary range (MP 6.3) associated with the Big Springs Cave hibernaculum. The primary range is presumed to be the area where most summer foraging and roosting occurs, although individual bats can occur

outside the primary range. Mist net surveys in the project area have not captured any Indiana bats (SEI 2003).

Direct, Indirect, and Cumulative Effects to Summer Foraging and Roosting Habitat

Alternative A – No Action

With Alternative A, no areas and/or potential habitat will be disturbed or thinned. Usual road maintenance, wildlife opening mowing and firewood gathering activities would continue. Therefore, implementation of Alternative A would have no direct, indirect or cumulative effect on Indiana bat summer foraging and roosting habitat.

Alternative B – Proposed Action

Alternative B includes approximately 10.2 acres of regeneration harvest within the 5-mile radius primary range (MP 6.3) around Big Springs Cave. In Alternative B, only one unit that has been proposed for harvesting activities in this entry occurs partially within the 5 mile radius around the hibernaculum. The timber unit that falls partially within the 5 mile radius of the cave is comprised of portions of Stands 61 and 62 in Compartment 20, near Forest Road 859A. Stand 62 just touches the boundary of MP 6.3, and the very small portion within MP 6.3 (0.2 acres) likely is within the margin of error of the GIS map layers depicting these features. These units are proposed to be harvested as two-age regeneration with timber removal accomplished by helicopter. Because most harvest activities will occur outside of MP 6.3, Alternative B will have minimal effects on summer foraging and roosting habitat. However, because the specific harvest units in Alternative B have not been cleared by mist net surveys, the possibility of take of individual roosting bats cannot be discounted. Such take would be within the limits allowed by the incidental take statement in the programmatic biological opinion (USFWS 2002). Direct, indirect, and cumulative effects associated with this level of take have been analyzed previously in the EA for the T&E forest plan amendment (USFS 2003).

Alternative C

With Alternative C, Stand 62, which just touches the boundary of MP 6.3, would be thinned. GIS mapping shows approximately 0.20 acres of thinning harvest within MP 6.3. This likely is within the margin of error of the GIS map layers depicting these features. Therefore, Alternative C will have minimal effects on summer foraging and roosting habitat. However, because the specific harvest units in Alternative C have not been cleared by mist net surveys, the possibility of take of individual bats roosting outside of the primary range cannot be discounted. Such take would be within the limits allowed by the incidental take statement in the programmatic biological opinion (USFWS 2002). Direct, indirect, and cumulative effects associated with this level of take have been analyzed previously in the EA for the T&E forest plan amendment (USFS 2003). Alternative C will have no effects beyond those previously disclosed, and anticipated effects are similar to those anticipated in the programmatic BO (USFWS 2002).

Fall/Swarming Habitat

Indiana bats begin swarming as early as August and continue through October or November, depending upon local weather conditions. Swarming entails congregating around and flying into and out of cave entrances from dusk to dawn, prior to hibernation (Kiser and Elliot 1996).

Fall/Swarming Habitat in and around the MNF and Lower Clover Area

The MNF provides approximately 203,235 acres of swarming habitat within 5 miles of known hibernacula. Swarming activity is believed to be concentrated within the 5-mile radius primary range (MP 6.3), but Indiana bats may also fall swarm around cave entrances not necessarily used as hibernacula. The closest non-hibernacula caves to the project area are Limestone Mountain cave (3 mi), Waybright cave (3.5 mi), Stillhouse and Elklick caves (4 mi) and Maxwell Run and Otter Creek caves (5 mi).

Direct, Indirect, and Cumulative Effects to Fall/Swarming Habitat

Alternative A – No Action

With Alternative A, no areas and/or potential habitat will be disturbed or thinned. Usual road maintenance, wildlife opening mowing and firewood gathering activities would continue. Therefore, implementation of Alternative A would have no direct, indirect, or cumulative effects on Indiana bat fall/swarming habitat.

Alternative B – Proposed Action

Alternative B includes approximately 10.2 acres of regeneration harvest within the 5-mile radius primary range (MP 6.3) around Big Springs Cave, which will affect fall/swarming habitat. Because most activities will occur outside the 5-mile radius of Big Springs Cave (MP 6.3), effects on fall/swarming habitat will be minimal. However, because the specific harvest units in Alternative B have not been cleared by mist net surveys, the possibility of take of individual roosting bats cannot be discounted. Such take would be within the limits allowed by the incidental take statement in the programmatic biological opinion (USFWS 2002). Direct, indirect, and cumulative effects associated with this level of take have been analyzed previously in the EA for the T&E forest plan amendment (USFS 2003).

Alternative C

With Alternative C, Stand 62, which just touches the boundary of MP 6.3, would be thinned. GIS mapping shows approximately 0.20 acres of thinning harvest within MP 6.3. This likely is within the margin of error of the GIS map layers depicting these features. Therefore, Alternative C will have minimal effects on fall/swarming habitat. However, because the specific harvest units that remain in Alternative C have not been cleared by mist net surveys, the possibility of take of individual bats roosting outside of the primary range cannot be discounted. Such take would be within the limits allowed by the incidental take statement in the programmatic biological opinion (USFWS 2002). Direct, indirect, and cumulative effects associated with this level of take have been analyzed previously in the EA for the T&E forest plan amendment (USFS 2003). Alternative C will have no effects beyond those previously disclosed, and anticipated effects are similar to those anticipated in the programmatic BO (USFWS 2002).

Key Area Habitat

A Key area consists of a group of mature stands totaling at least 150 acres and located near an Indiana bat hibernaculum. This area should include 20 acres of old growth forest or potential old growth and an additional 130 acres of mature forest. As appropriate, the area should include the area around the cave entrance, area above the cave entrance, foraging corridor and ridge tops/side slopes around the cave.

Key Area Habitat in and around the MNF and Lower Clover Area

The key area for the Big Springs cave Indiana bat hibernaculum is not located in the Lower Clover project area.

Direct and Indirect Effects to Key Area Habitat

Any activity proposed in Lower Clover project area, including all project alternatives analyzed herein, would have no direct, indirect or cumulative effects on the key area identified for Big Springs cave. The Indiana bat Key Area around Big Springs cave is not analyzed further.

Areas of influence for Indiana bats and the relationship with the Lower Clover project alternatives are displayed in the table below.

Table 3-13. Areas of Influence for Indiana Bat in Relation to Lower Clover Alternatives.

Areas of Influence:	Rx	OA	Unit of measure	Is this habitat Present within Lower Clover	Will this habitat be affected by Alt. A project activities?	Will this habitat be affected by Alt. B project activities?	Will this habitat be affected by Alt. C project activities?
Hibernacula	8.0	838	200' around hibernaculum entrance	No	No	No	No
Maternity Sites	8.0	838	2 mile radius	No	No	No	No
Primary Range: Primary foraging Summer roosting Fall swarming	6.3		5 mile radius around cave entrance	Yes	No	10.2 acres	Approximately 0.2 acres
Key areas	8.0	838	150 acres of oldest habitat closest to hibernaculum	No	No	No	No

Virginia Big-eared Bat

The Virginia big-eared bat is a geographically isolated and sporadically distributed cave obligate species feeding predominantly on moths (Dalton et al. 1986, Sample and Whitmore 1993).

Hibernacula

Virginia big-eared bat begin to return to hibernacula in September, but continue feeding during warm evenings. By December, they hibernate in dense clusters on cave ceilings.

Hibernacula Habitat in and around the MNF and Lower Clover Area

Nine West Virginia caves are monitored as Virginia big-eared bat hibernacula. Three caves are found on the MNF and harbor approximately 7% of all Virginia big-eared bat in West Virginia during winter. Hibernacula caves, as well as 200 foot buffers around them, are considered as part of the areas of influence for Virginia big-eared bats. Hibernacula are protected under MP 8.0 and Zoological Area standards for Opportunity Area 837. The closest hibernaculum to the Lower Clover project area is Big Springs cave approximately 4 miles away. The most recent 2003 winter cave survey tallied two Virginia big-eared bats hibernating in Big Springs cave.

Direct, Indirect and Cumulative Effects to Hibernacula Habitat

Because the Lower Clover project area is well outside the 200-foot buffer zone surrounding the hibernaculum, any activity proposed in Lower Clover project area, including all project alternatives analyzed herein, would have no direct, indirect or cumulative effect on Big Springs cave or any Virginia big-eared bats occupying that cave. Winter hibernacula habitat for Virginia big-eared bats is not analyzed further.

Summer Maternity Colonies and Bachelor Habitat

Female maternity colonies generally utilize warm caves, though some may use cold caves. Nocturnal activities in maternity colonies vary as the maternity season progresses. During May and most of June, when females are pregnant, the colony remains outside the cave most of the night. After birth in late June and July, nightly emergent behavior of the mother depends on the needs of her young. Male Virginia big-eared bat also use caves in the summer, although they inhabit different areas of the cave than the females, and roost together in bachelor colonies (USFS 2001 and references therein).

Identified Summer Maternity and Bachelor Habitat on the MNF and Lower Clover Area

Eleven caves in WV are monitored for summer Virginia big-eared bat use by WVDNR. Three of these are on MNF land. Maternity colonies on MNF land are protected under MP 8.0 and Zoological Area standards for Opportunity Area 837. Protection includes a 200-foot buffer around entrances to occupied caves. No maternity or bachelor colonies are located in the vicinity of the Lower Clover project area. Big Springs cave, located approximately 4 miles from the southeast section of Lower Clover, is not used by Virginia big-eared bats as a maternity or bachelor colony site. Cave Hollow/Arbogast cave, located over 8 miles from the project area, is the closest known maternity site to the project area. Cave Hollow/Arbogast has been designated as critical habitat by the USFWS.

Direct, Indirect and Cumulative Effects to Summer Maternity and Bachelor habitat

Any project activity within the Lower Clover analysis area will have no direct, indirect or cumulative effect on identified summer maternity colonies or bachelor habitat for Virginia big-eared bats because this habitat is not found in the Lower Clover project area. Summer colony or bachelor habitat for Virginia big-eared bats is not analyzed further.

Summer Foraging and Night Roosting Habitat

Observational research shows Virginia big-eared bat forage only after dark. Virginia big-eared bat forage near their caves. In general, distances from roosts to centers of foraging areas do not differ between males and females (Adam et al. 1994), though foraging area size for females may increase during the summer. The maximum distance a male bat has been found from its roost was 5.04 miles (8.4 km). Maximum distance a female was found from the maternity colony was 2.19 miles (3.65 km) (Adam et al 1994).

Summer Foraging in and around the MNF and Lower Clover Area

Based on information that Virginia big-eared bat travel up to 6 miles from their caves to forage (Stihler 1995), the area within this 6-mile radius would be considered Virginia big-eared bat forage habitat. Habitat within the 6-mile foraging radius surrounding the eleven monitored Virginia big-eared bat maternity/bachelor caves is very diverse. Seventy-six percent of the

559,486 acres is privately owned, and the majority is in agricultural use. Of the less than 25% that is National Forest, more than 95% is forested habitat over 60 years old.

Although Big Springs cave serves as a Virginia big-eared bat hibernaculum, it is not used during the summer as either a maternity site or bachelor colony site, therefore it can be assumed that foraging activities may be limited to early spring when the bats are emerging from hibernation and fall when bats are returning to the cave for hibernation. This is further documented by the fact that summer mist netting surveys completed on the MNF in 1997 and 2003 within and around the Lower Clover analysis area did not capture any Virginia big-eared bats. Summer mist net studies done by the Fernow Experimental forest around Big Springs cave in 2000, 2001, 2002 and 2003 have not captured any Virginia big-eared bats. The only confirmed presence has been the capture of a single male Virginia big-eared bat in October, 1995 by the WVDNR, emphasizing use of the area for fall foraging versus summer foraging.

Direct, Indirect and Cumulative Effects to Summer Foraging and Night Roosting Habitat

Because there are no maternity or bachelor sites near the project area, none of the alternatives would have direct, indirect, or cumulative effects on Virginia big-eared bat summer foraging or night roosting habitat. Summer foraging and night roosting habitat for Virginia big-eared bats is not analyzed further.

Fall/Migratory Habitat

Virginia big-eared bat move readily from one roost to another, but they probably do not migrate long distances (Barbour and Davis 1969). They have been documented foraging in a wide variety of habitats, both forested and open (USFS 2001 and references therein).

Fall/Migratory Habitat in and around the MNF and Lower Clover Area

Virginia big-eared bat appear to move readily from summer roost caves to other caves for winter hibernacula. Late summer telemetry studies (9August -21August) indicate that Virginia big-eared bat on the MNF are using similar habitats for foraging as documented for early summer with the exception that agricultural fields (corn and possibly soy beans) were used during this session and not earlier (Stihler, 1999). Fall foraging data on the MNF is limited. It is possible that the few documented bats moving back to Big Springs cave for hibernation may fall forage within the Lower Clover area.

Direct, Indirect and Cumulative Effects to Fall/Migratory habitat

Alternative A – No Action

With Alternative A, no areas and/or potential habitat will be disturbed or thinned. Usual road maintenance, wildlife opening mowing and firewood gathering activities would continue. Therefore, implementation of Alternative A would have no direct, indirect or cumulative effect on Virginia big-eared bat fall/migratory habitat.

Alternative B – Proposed Action

Alternative B will involve 47 acres of regeneration harvest within the 6-mile radius Virginia big-eared bat foraging area surrounding Big Springs Cave. Because the bats return to the cave during the day when harvest activities will occur, there will be no potential for take. Indirectly, the harvest could have a beneficial effect on fall/migratory habitat by increasing habitat diversity. Currently about 93 percent of the National Forest land in the foraging radius of Big Springs Cave

is forest over 30 years old. Gap analysis data (Strager and Yuill 2002) show that for all ownerships, the Big Springs Cave foraging radius is about 90 percent forested. Temporary openings created by regeneration harvest will increase diversity of the habitat, although any beneficial effect will be exceedingly small since it involves only 0.06 percent of the 72,382 acres of land in the 6-mile radius foraging area.

Current conditions integrate the effects of past and present activities; evaluation of cumulative impacts requires consideration of reasonably foreseeable future activities as well. On National Forest land (68 percent of the foraging circle), potential future actions include thinning and regeneration harvests to benefit the Indiana bat and to create age class diversity. Activities are also likely to include creation and maintenance of wildlife openings and water sources. Large areas of National Forest land in the foraging circle are in a designated wilderness area or remote backcountry areas where little or no management occurs. Natural succession and disturbance events will control habitat conditions in these areas. On private land within the foraging circle, forest management is likely to continue to be the dominant land use, with scattered agricultural and residential development. The proposed action will make a very small contribution to this general trend toward increasing habitat diversity. The contribution of the proposed action to cumulative effects would disappear when the tree canopy closes in about 20 years.

Forestwide, The majority of Virginia big-eared bat foraging habitat is on private lands, and is in mixed habitats consisting of forests, pastures, and other agricultural uses. This is providing a variety of foraging opportunities for this species. Most activities would have a somewhat beneficial effect on Virginia big-eared bat by adding to that diversity of habitat (i.e. travel corridors). Maintaining habitat diversity would have a positive effect. Forest Service activities such as prescribed burning, TSI, and wildlife habitat improvements produce positive effects for Virginia big-eared bat by diversifying habitat, but are done in such small amounts within their foraging range that there is little measurable effect. The contribution of the proposed action to cumulative effects at the Forestwide scale is not measurable.

Alternative C

Alternative C includes 35 acres of commercial thinning in potential fall/migratory habitat within 6 miles of the Big Springs Cave hibernaculum. Because the bats return to the cave during the day when harvest activities would occur, there would be no potential for take. Thinning would cause a temporary reduction of canopy cover that would contribute to beneficial habitat diversity. However, the area to be thinned is only 0.05 percent of the Big Springs Cave fall/migratory habitat circle, so any effects would be extremely small. The canopy would close within a few years, so the time period within which Alternative C could contribute to cumulative effects would be very short. Thinning might contribute to the beneficial effects of future activities that create habitat diversity within the foraging circle. However, because of the small acreage involved and the short duration of the effects of thinning, it is likely that any contribution to cumulative effects would not be measurable.

Sensitive Species

(To be added from BE)

Birds of Conservation Concern

This section of the EA has been prepared in response to the President's Executive Order 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds" of January 10, 2001.

Based on the document "Birds of Conservation Concern 2002" (USFWS, December 2002) the Monongahela National Forest and the state of West Virginia occur within the Appalachian Mountain Bird Conservation Region, (BCR) 28. There are 27 species of birds that are listed as birds of conservation concern for the Appalachian Mountain Bird Conservation Region.

To simplify a discussion of the effects of the alternatives, these species have been grouped by the type of habitat they use (species using forested habitat, species using non-forested habitat or young forest/brushy habitat, and species using both forested and non-forested habitat). A description of each of these species and its habitat is provided below.

Species using forested habitat

Kentucky Warbler – dense under story of mature, humid deciduous forest, wooded ravines, oak-pine or northern hardwood forest. This species has been documented from the project area.

Louisiana Waterthrush – along streams flowing though heavily wooded valleys, deciduous forest, some hemlock, northern hardwoods. This species has been documented from the project area.

Swainson's Warbler – dense under story under an older forest, rhododendron or mountain laurel thickets in woods, mostly found in the south and west part of the state. Potential habitat could occur in the project area, but the species has not been documented there.

Worm-eating Warbler – mature deciduous woodland that lacks dense ground cover, mature beech-maple or oak-pine forest. This species has been documented from the project area.

Cerulean Warbler – mature forest, mixed mesophytic and oak forest below 600 meters in elevation, common in the west part of the state, sparse in the mountains. This species has been documented from the project area.

Wood Thrush – mature or near mature deciduous forest, prefers dense shade on forest floor. This species has been documented from the project area.

Acadian Flycatcher – mature mixed deciduous forest dissected by small streams and ravines; lower elevations; not in spruce, oak or pine forest; nests over water; more common in the west side of the state. This species has been documented from the project area.

Yellow–bellied Sapsucker (breeding populations only) – upland black cherry forest, cut over mature hardwoods, spruce-hardwoods. Potential habitat occurs, but the species has not been documented from the project area.

Whip-poor-will – mixed deciduous woods, upland oak-hickory forest, not in spruce, hardwood-pine or hardwood-hemlock, few in northern hardwoods, rare in dense forest. Potential habitat could occur. The species has been documented just outside the project area.

Northern Saw-whet owl (breeding populations only) – spruce and mixed spruce-hardwoods, swampy areas in coniferous forest, high elevations. Unlikely to occur in the project area due to lack of habitat.

Black-billed Cuckoo – northern hardwoods, cove hardwoods, oak-hickory forest. This species has been documented from the project area.

Prothonotary Warbler – swamps (wooded wetlands) and large streams, not in the highlands. Unlikely to occur in the project area due to lack of habitat.

Red-headed Woodpecker – open oak groves with little understory, groves of oaks and grazing lands, Ohio River valley and low elevations in the Allegheny Mountains. Potential habitat could occur in the project area, but the species has not been documented there.

Species using non-forested habitat (grassland or other permanent openings)

Upland Sandpiper – grass, old field habitat, grassy mountain tops and reclaimed surface mines, pastures, airports, golf courses. Unlikely to occur in the project area due to lack of habitat.

Buff-breasted Sandpiper – short grass, not listed in the WV breeding bird atlas, accidental/hypothetical to WV. Nests in the arctic shores of Alaska and Canada. Winters in the pampas of Argentina. Migrates up the Mississippi Valley and to the west. Unlikely to occur in the project area due to lack of habitat.

Short-eared Owl – extensive open grassland, meadows, prairies, plains, marshes, dunes, tundra, not listed in the WV breeding bird atlas. Unlikely to occur in the project area due to lack of habitat.

Sedge Wren – wet grass and sedge meadows, nests near surface of water, needs wetlands, grassy marshes. Unlikely to occur in the project area due to lack of habitat.

Henslow's Sparrow – grassy, weed filled fields, fields of broom sedge and weeds, early years of plant succession. Unlikely to occur in the project area due to lack of habitat.

Species using young forest/brushy habitat

Olive-sided Flycatcher – in openings in northern spruce forests, such as bogs, old beaver ponds, burned over slash from lumber operations with scattered snags and trees for perches. Unlikely to occur in the project area due to lack of habitat.

Bachman's Sparrow – brushy overgrown fields, abandoned pastures growing up in shrubs, often in erosion gullies in steep hill sides, much un-used habitat remains. Unlikely to occur in the project area due to lack of habitat.

Bewick's Wren – dry open country in valleys east of the mountains, in small clearings in spruce at high elevations, brushy thickets, favors old farm buildings, old farmsteads, very local or extirpated. Unlikely to occur in the project area as it is nearing extirpation in the region.

Prairie Warbler – young pine forests and brushy scrub, young second growth hardwoods, overgrown pastures, Christmas tree plantations. Potential habitat could occur in the project area, but the species has not been documented there.

Golden-winged Warbler – low, brushy second growth forest and open woodland, especially powerline rights of way, higher elevations, not in spruce. This species has been documented from the project area.

Species using both forest and non-forest habitat

Peregrine Falcon – nests in cliffs, bridges over water, or high rise buildings in urban areas. Feeds over fields, forest, or urban areas by catching birds during flight. No suitable nesting habitat exists in the project area; migrants or wandering individuals could pass through.

Species not applicable to the MNF

Red Crossbill (southern Appalachian populations only) – not applicable to WV or the MNF

Black-capped Chickadee (southern Blue Ridge populations only) – not applicable to WV or the MNF

Chuck-will's-widow – No nest records from the state, mostly found in western hills portion of the state. The MNF is outside the known breeding range of this species.

Of the 24 species of birds of conservation concern in the Appalachian Bird Conservation Region that are applicable to the MNF, 13 (54%) use primarily mature forest habitats. Permanent herbaceous openings and young forest/brushy habitat are each used by 5 species (21%). One species (4%) has very specific nest site requirements, but forages over a broad variety of habitats.

Direct, Indirect, and Cumulative Effects

Alternative A – No Action

Under Alternative A, no timber harvest or road construction/reconstruction would occur, so Alternative A would have no direct effects on Birds of Conservation Concern. Indirectly, natural succession would continue, and the project area would trend toward older forest conditions. This trend generally would have no effects or beneficial effects on species that use forested habitats. Species using non-forest habitats would not be affected, because no new permanent openings would be created and existing openings would continue to be maintained. Habitat for species using young forest/brushy areas would decline as young forests in previously harvested areas mature. However, some young forest/brushy habitat would be provided by natural disturbances. Lack of management under Alternative A would not contribute to the cumulative effects of past, present, and reasonably foreseeable future management actions.

Alternative B – Proposed Action

Species using forested habitat: In the short term, the two-age harvests in Alternative B, as originally proposed, would temporarily remove or adversely alter 380 acres of habitat for species that use forested habitats. Construction of new roads and landings would add a small amount of permanent or semi-permanent openings. Some individuals could be subject to direct mortality during harvest operations, particularly if harvesting occurs during the nesting season (generally May through August for these species). Some of these species would cease to use the harvested areas, while others would persist at lower densities due to the retained basal areas. Two of the species that use forested habitats, red-headed woodpecker and whip-poor-will, prefer open forests and could benefit from the broken-canopy conditions provided by the two-age harvests. These effects would persist for a period of about 20 years until the canopy closes. The thinning harvests included in the proposed action would have short-term effects until the canopy closes again in a few years. These effects would be detrimental to those forest species that prefer a closed canopy, but beneficial to those that use dense understory vegetation. Thinning might provide a short-term benefit to red-headed woodpecker and whip-poor-will. The very minimal effects from the new roads and landings would persist as long as these openings are maintained.

All of these effects would contribute to the cumulative effects of temporary and permanent removal of forest habitat due to past, present, and reasonably foreseeable future actions such as other timber harvests, agricultural and residential development, gas well/pipeline development, and road/highway construction. Most of the proposed project's contribution to these effects would cease when the two-age harvest units achieve canopy closure. Minimal cumulative effects due to the new road and landings would persist as long as these openings are maintained. Despite the cumulative effects of all of these actions, the project area is expected to remain dominated by mature forests. While populations of species that use forested habitat are likely to decline somewhat over time, these effects are not expected to extirpate any species from the project area.

Species using non-forested habitat: Species using non-forest habitats are unlikely to be affected by the proposed project. They are not known to occur in the project area now, and the non-forest habitats created by the new road and landings likely would not be large enough to provide habitat for any of these species.

Species using young forest/brushy habitat: Species that use young forest/brushy habitat likely would not suffer direct mortality from the proposed action because they would not be present in mature forested areas when harvesting would occur. Indirectly, these species would benefit from the brushy habitat created by the two-age regeneration harvest and the edge conditions created along the new road and landings. These effects would persist for about 20 years until the forest canopy closes again and shades out the brushy habitat. Minimal benefits due to edge along the new road and landings would persist as long as these openings are maintained. Thinning harvests are unlikely to affect these species because they will not create the type of open-canopy brushy habitat that these species prefer. Effects from the two-age harvests, road, and landings would contribute to the cumulative effects of creation of temporary and permanent young forest/brushy habitat due to past, present, and reasonably foreseeable future actions such as other timber harvests, agricultural and residential development, gas well/pipeline development, and road/highway construction. Most of the proposed project's contribution to these effects would cease when the two-age harvest units achieve canopy closure. Minimal cumulative effects due to the new road and landings would persist as long as these openings are maintained. Cumulative effects of all of these actions could result in larger populations of these species in the project area.

Species using both forest and non-forest habitat: Suitable nesting habitat for the peregrine falcon is not known to occur near the project area, so the proposed project would not affect this species.

Alternative C – Thinning Only

Species using forested habitat: Some individuals could be subject to direct mortality during harvest operations, particularly if harvesting occurs during the nesting season (generally May through August for these species). Thinning harvests would have short-term effects until the canopy closes again in a few years. These effects would be detrimental to those forest species that prefer a closed canopy, but beneficial to those that use dense understory vegetation. Thinning might provide a short-term benefit to red-headed woodpecker and whip-poor-will, which prefer broken-canopy forests. The very minimal effects from the new roads and landings would persist as long as these openings are maintained. All of these effects would contribute to the cumulative effects of temporary and permanent removal of forest habitat and thinning of

forest canopies due to past, present, and reasonably foreseeable future actions such as other timber harvests, agricultural and residential development, gas well/pipeline development, and road/highway construction. However, most of the project's contribution to these effects would be very short-term, lasting only a few years until the canopy closes again. Minimal cumulative effects due to the new road and landings would persist as long as these openings are maintained. Despite the cumulative effects of all of these actions, the project area is expected to remain dominated by mature forests. While populations of species that use forested habitat are likely to decline somewhat over time, these effects are not expected to extirpate any species from the project area.

Species using non-forested habitat: Species using non-forest habitats are unlikely to be affected by Alternative C. They are not known to occur in the project area now, and the non-forest habitats created by the new road and landings likely would not be large enough to provide habitat for any of these species.

Species using young forest/brushy habitat: Species that use young forest/brushy habitat likely would not suffer direct mortality from Alternative C because they would not be present in mature forested areas when harvesting would occur. Thinning harvests are unlikely to affect these species indirectly because they will not create the type of open-canopy brushy habitat that these species prefer. The new road construction and landings associated with Alternative C will create a small amount of edge habitat that may benefit some of these species, although the effect would be very small. The effects of these edge habitats could make a very small contribution to the cumulative effects of creation of temporary and permanent young forest/brushy habitat due to past, present, and reasonably foreseeable future actions such as other timber harvests, agricultural and residential development, gas well/pipeline development, and road/highway construction. The contribution to these effects would persist as long as the new road and landings are maintained as openings. Cumulative effects of all of these actions could result in larger populations of these species in the project area.

Species using both forest and non-forest habitat: Suitable nesting habitat for the peregrine falcon is not known to occur near the project area, so the proposed project would not affect this species.

Social Resources

Economics

Resource Impacts Addressed

This section of the EA discloses the potential economic impacts of Lower Clover alternatives. It addresses public comments regarding the monetary costs and benefits of proposed activities. Other sections of the EA describe effects on non-monetary values such as water quality, fish and wildlife habitat, recreation opportunities, vegetation, etc.

Affected Environment

The project area does not currently produce market benefits (timber products). It offers many indirect economic benefits via the ecosystem services it provides: water storage and filtration; a diversity of habitats for aquatic and terrestrial fauna and flora, including threatened, endangered, and sensitive species; and recreational opportunities, like wildlife viewing, fishing, hunting,

hiking, and biking. The Forest has not tracked such economic benefits in quantitative terms. Qualitative descriptions of the resources provided by the project area are described in other parts of the EA. Costs currently incurred in the area are associated with routine maintenance, like grading and brushing roads, cleaning ditches, mowing wildlife openings, etc.

Scope of the Analysis

The project area, and as appropriate, nearby communities, were considered in the analysis of effects. Most MNF sales are sold to area mills (Hudak, 2004). Residents and associated businesses in nearby communities are expected to benefit directly from timber products removed from the area and indirectly from employment opportunities generated. The temporal boundary used for analysis of effects was up to ten years from the time a timber sale is awarded. Most costs and benefits from timber harvest activities (sale of timber products, employment opportunities, etc.) are expected to be generated in the first five years after a sale is awarded. Post-timber sale related activities are usually completed within the first year after a sale closes; although, some post-sale activities such as stocking surveys and tree planting can occur five years after a sale is completed.

Methodology

Table 3-14 and 3-15 display the direct costs and values generally associated with timber sale-related activities. The costs identified are only those expected to be incurred by the Federal government. Costs incurred by timber purchasers or other parties are not known.

Table 3-14. Costs of Actions, All Action Alternatives

Item	Cost
Sale Preparation	$36.00/CCF
Sale Administration	$12.00/CCF
Site Preparation	$100.00/acre
Stocking Surveys	$35.00/acre
Vegetation Control w/herbicide	$190.00/acre
Vine Control w/hand tools	$80.00/acre
Plant Seedlings	$90.00/acre
Fence Construction	$3.00/foot
Road Costs	$74,405/mile

The table below identifies the approximate percentage of saw timber volume that may be removed, by species, during timber harvest operations. Values are from the base period selling prices and costs in FSH 2409.18, Chapter 40, effective date of April 15, 2004.

Table 3-15. Timber Values, all Alternatives

Species	Value/CCF	Approximate % of Sale Volume
Red maple saw timber	$77.64	5
Sugar maple saw timber	$101.82	5
Yellow poplar saw timber	$76.50	21
White oak saw timber	$26.86	7
Scarlet oak saw timber	$20.87	6
Chestnut oak saw timber	$26.58	13
Northern red oak saw timber	$336.55	35
Basswood saw timber	$64.21	3
Other saw timber	$28.80	5

Quick Silver economic software was used for this analysis. The costs for timber sale administration and preparation were derived from comparisons of past forest budgets for timber sale preparation and administration and timber volume outputs. These costs were included in the Quick-Silver analysis as costs per unit volume. The costs of temporary road construction and heavy road maintenance were included as separate items and were based on estimates provided by engineers. Volumes and values were entered as benefits. For purposes of this analysis, inflation was assumed to be zero percent.

Direct/Indirect Environmental Consequences

Alternative A – No Action

No timber related activities would be implemented under Alternative A. Thus, no costs, other than those currently expended for existing maintenance activities would be incurred. No direct economic benefits would be generated since timber products would not be sold from the area. Timber-related employment opportunities and incomes to associated local community businesses would not be generated. The area would continue to provide the indirect benefits described under the affected environment.

Alternative B – Proposed Action

Timber sale activities in the project area would generate direct and indirect costs and benefits. Without deducting construction costs, Alternative B could have a positive net return of approximately $397,600 if the sale is sold at the minimum acceptable bid rate (stumpage value of approximately 967,700 minus timber costs). However, the Forest routinely receives bids well above the minimum acceptable bid rate, as high as 85% above the minimal acceptable bid. Based on the average bid on timber sales within the past five years, it is possible Alternative B could result in a positive net return of approximately $1,220,200 (stumpage value of about 1,790,300 minus timber costs).

With road costs included, Alternative B could have a negative net return of approximately $71,100 if the timber sale is sold at the minimum acceptable bid rate. If the bid is consistent with the average bid for MNF timber sales within the past five years, then the timber sale could have a positive net return of about $751,000.

Vegetation control with herbicide, vine control, and planting and fencing would be an additional cost of about $104,000.

The extent of activity in the project area and effects to other resources are limited (see other effects sections in this EA); thus non-monetary benefits currently provided by the area such as water resources, recreation, wildlife, scenery, etc. would be maintained. Alternative B would provide additional values in that timber harvesting would increase vegetative diversity in the area and create early successional habitat for various wildlife (Silviculture and Wildlife effects).

Alternative C

Alternative C would incur more expenses and provide less revenue than Alternative B. This is because the thinning harvest method is more expensive with helicopter logging due to lower production rates. Thinning harvests produce less volume, lower value, and are not as efficient as regeneration harvests.

Without deducting road costs, Alternative C could have a positive net return of approximately $116,900 if the sale is sold at the minimum acceptable bid (stumpage of about 408,600 minus timber costs). However, as explained under Alternative B, it is possible bids will exceed the

minimum acceptable bid. The timber sale could have a positive net return of about $464,200 (stumpage value of 755,900 minus timber costs).

If road costs are factored in, Alternative C would have a negative net return of approximately $352,000 if the sale is sold at the minimum acceptable bid. If bids are consistent with the average bid on timber sales within the past five years, the sale could have a negative net return of about $4,600. There would be no costs for herbicide, vine control, or fencing, since these activities would not be implemented under Alternative C.

Alternative C would have little effect on the non-monetary values currently generated by the area (see effects disclosed in other sections of the EA). It may increase vegetative diversity within cut stands, but it would not create early successional habitat for wildlife (Silviculture and Wildlife effects).

Cumulative Impacts

Alternative A – No Action
Alternative A would not generate new direct or indirect costs and benefits that would add to the effects of past, present, or future actions because new activities would not be implemented. Therefore, there would be no cumulative effects.

Alternative B – Proposed Action
The past and present timber, mineral, and road activities on federal and non-federal lands in and around the Lower Clover (which were documented earlier in Chapter 3) have generated direct and indirect economic costs and benefits for federal and non-federal entities. Monetary costs and benefits generated from Federal activities are documented in the John Hog, North Pheasant, New Pheasant, Hobson/Laurel, and Harper Cemetary timber sale folders, mineral folders, and transportation records. The extent of costs and benefits generated from harvests conducted on private land in Mill Run, Indian Run, Valley Fork, Smoky Hollow, and others is not known. It is assumed that such activities generate positive returns.

Future activities on Federal and non-federal lands are expected to generate additional economic costs and benefits. The wildlife openings that may be created in the future would generate costs, but the extent of costs are not known since the proposal has not been finalized to date. Such openings would provide non-monetary values in the form of habitat for species that forage, nest, and seek cover in grassy openings, as documented in the Wildlife effects of this EA. Corridor H is not expected to be constructed until 2013 or later, thus it is not likely to contribute cumulatively to the economic effects of Lower Clover actions. Drilling, installation, and maintenance of gas wells and pipelines on federal and non-federal land in the future is probable and would likely provide job opportunities, but not enough information is available to assess the extent of impacts.

Alternative B will generate benefits like past, present, and reasonably foreseeable future actions in that job opportunities would be provided. It may also provide benefits if the sale generates revenue greater than costs. However, Alternative B may have an adverse effect if costs are greater than the income generated from the sale. Irregardless of whether it is sold above or below cost, non-monetary benefits such as water resources, recreation, wildlife, scenery, etc. would be continue to be provided (see other effects sections in this EA). Also, it will have helped achieve the purpose and need of maintaining a mosaic of stands in the project area (Chapter 1).

Alternative C
The cumulative effects of Alternative C would be similar to those of Alternative B, but the costs would be greater and the benefits incurred would be less.

Unavoidable Adverse Impacts
The No Action Alternative would not have unavoidable adverse impacts, but the purpose and need identified for the area would not be met. Alternatives B and C could result in unavoidable adverse impacts if the final bid on a timber sale results in a below cost sale.

Irreversible or Irretrievable Commitment of Resources
Alternative B is expected to return a surplus to the treasury, but in the event the timber is sold for minimum acceptable bid, there could be a deficit. Alternative C is expected to result in a deficit.

Consistency with the Forest Plan
The economic analysis presented here is consistent with the Forest Plan guideline to conduct an economic analysis, as appropriate, as part of the environmental analysis process (Forest Plan, p. 57). All alternatives would be consistent with Forest Plan goals and other direction identified on pp. 38, 40, 74, 76, 78, 127-128 of the Forest Plan.

Environmental Justice

Resource Impacts Addressed
This section summarizes the results of the analysis the Forest completed to assess the impacts of proposed activities on minority and low income populations per Executive Order 12898.

Affected Environment
There are no known community-identified environmental justice related issues. Recent data indicate that Tucker County, the county in which the Lower Clover project area is located, does not demonstrate ethnic populations or income percentages greater than two times that of the State average (U.S. Census Bureau, Census 2000).

Scope of the Analysis
The communities in Tucker County were considered in the scope of the analysis. The temporal boundary considered was five years from the date timber sales are awarded, since average MNF sales are implemented within five years from the date of award.

Methodology
Information from the US Census Bureau was used to assess the make up of communities in Tucker County and the possible effects of the alternatives.

Direct/Indirect Environmental Consequences of All Alternatives
None of the alternatives would pose disproportionately high or adverse impacts on minority or low income populations. Affected communities have been provided opportunities to comment during the planning process (see Public Involvement section in Chapter 2).

Cumulative Impacts
No past, present, or future actions previously identified in this chapter are expected to contribute cumulative disproportionately high or adverse impact on minority or low income populations.

Unavoidable Adverse Impacts
None of the alternatives would result in unavoidable adverse impacts.

Irreversible or Irretrievable Commitment of Resources

None of the Lower Clover activities would result in irreversible or irretrievable commitment of resources as it relates to environmental justice.

Consistency with the Forest Plan

All the Lower Clover alternatives would be consistent with the Forest Plan (Forest Plan, p. 39).

Heritage Resources

Resource Impacts Addressed

This section describes potential impacts Lower Clover alternatives may have on heritage sites.

Affected Environment

Ten heritage resources have been recorded on Forest Service land in the project area. Of these, one represents the remains of prehistoric resource exploitation and/or habitation, eight represent Euro-American historic period activities; and one represents a multi-component prehistoric/early 20th century deposit (see 01/21/2004 Heritage Resource Report for the Lower Clover Project).

Five of the ten heritage sites have been evaluated for their eligibility for inclusion in the National Register of Historic Places. Four of these have been found not to retain sufficient integrity and/or research potential to provide important information regarding the occupation and use of the area. They are, therefore, not eligible for placement on the National Register and do not need to be protected during project implementation. The remaining evaluated site, Corrick's Ford, has been found eligible to the National Register of Historic Places. The five unevaluated sites would be managed as though eligible until such time as they are evaluated.

Scope of the Analysis

Heritage site boundaries and the Lower Clover project area boundary were the spatial boundaries used to evaluate the effects of the alternatives; these boundaries were used because direct, indirect, and cumulative effects are not expected to extend beyond the location of heritage sites within the project area. The temporal boundary used for the analysis was five years after the awarding of timber sales. This is because activities and potential effects could occur anytime during the contract period of the timber sale.

Methodology

Three heritage resources surveys were conducted within the analysis area (01/21/2004 Heritage Resource Report). These surveys provided coverage for the area of the project planned to be affected by the alternative actions. Effects to heritage resource from the alternatives were identified using ArcView GIS mapping. Base maps showing the project area and potential actions for each alternative were overlain on site location and survey maps.

Direct/Indirect Environmental Consequences

Alternative A – No Action

The No Action Alternative would not affect heritage resources, as no new erosion or soil disturbance from logging, road construction, and other project-related activities would occur.

Environmental Consequences Common to All Action Alternatives

Neither Alternative B nor Alternative C would directly impact known eligible or potentially eligible heritage resources. Tree felling, skidding, and activities associated with road work (grading, cutting, culvert replacement or construction, etc.) would not directly nor negatively

affect known heritage resources. Negative indirect effects to known heritage resources would not be derived from increased erosion associated with road construction, skidding, and regeneration cutting. Mitigation identified in Chapter 2 would be implemented to avoid adverse effects should new sites be discovered during project implementation.

Cumulative Impacts

None of the alternatives would directly or indirectly affect known heritage sites. Mitigation identified in Chapter 2 would be implemented to avoid adverse effects should new sites be discovered during project implementation. Thus, no adverse cumulative impacts are anticipated.

Unavoidable Adverse Impacts

None of the Lower Clover alternatives are expected to result in unavoidable adverse impacts.

Irreversible or Irretrievable Commitment of Resources

None of the alternatives are expected to result in irreversible or irretrievable commitment of resources, since all known heritage sites would be avoided.

Consistency with the Forest Plan

Given that known National Register eligible sites would be avoided or mitigated, and known unevaluated sites would be avoided or evaluated and appropriate management taken, all Lower Clover alternatives would be consistent with Forest Plan goals and direction (pp. 40, 70, and Appendix Q).

Recreation

Resource Impacts Addressed

This section discloses how recreation resources in the Lower Clover project area would be affected by proposed activities. It answers the following questions that were raised by the public: (1) what recreation use occurs in the project area now; (2) how will recreation use be affected by proposed activities; (3) what effects would activities have on the American Discovery Trail; and (4) how would road improvements affect visitor access?

Affected Environment

The area is used year round for recreation activities. Recreational opportunities include hunting, fishing, dispersed camping, sightseeing, and gathering forest products (e.g. firewood, moss, and ginseng). Recreation use is generally low in the project area as compared to other places on the Monongahela National Forest. No developed recreation sites exist. A dispersed recreation site is located off of County Route 17 just north of Clover Run. The only trail in the project area is the American Discovery Trail. This trail enters the Monongahela National Forest near Texas Mountain on State Route 21/1; it is located on State roads in this area because of the patchy federal ownership. There are approximately 12 miles of Forest Service roads in the project area. Most of these roads are closed to public motorized use. The only roads open for public access are about 0.1 miles of FR 952 and about 6.5 miles of 767, which is open seasonally from October 15 to December 31 (Roads Analysis Report). Road maintenance (cleaning ditches and culverts, grading, and stoning) is performed on area roads as needed.

No wilderness or special areas are located within the project area. The Cheat River was considered ineligible and dropped from further consideration as a potential wild and scenic river based on the wild and scenic river study report, p. 3-13.

Scope of the Analysis

The scope of the analysis for direct, indirect, and cumulative effects was limited to the project and the area immediately surrounding the project area. This is because the anticipated effects to recreation would be limited, as described below. The temporal boundary used for assessing effects was 0-7 years from the time a timber sale is awarded. This time frame was used because a sale can be implemented anytime within 5 years of the date of awarding, and the effects of activities such as fencing could occur up to two years after the sale is complete.

Methodology

Effects were determined following field review of the affected environment, review of the Forest Plan, and based on general experience in the field of recreation. The units of measure used were number of developed or dispersed sites impacted; whether there would be impacts to trails, special areas, wilderness, or wild and scenic rivers; and acres or miles of changed public access.

Environmental Consequences Common to All Action Alternatives

Neither of the action alternatives is expected to noticeably change existing recreation opportunities in the project area. As explained below, proposed activities are not expected to noticeably affect recreation use levels.

There would continue to be no developed sites in the project area. There are no activities that would affect the dispersed site in the area or the American Discovery Trail (Scenery effects). The American Discovery Trail would continue to be managed in its current location.

No changes are expected in long-term public access, motorized or non-motorized. As under Alternative A, FR 767 would be improved; this would provide the public better driving conditions during the hunting season. All new roads would be gated. Proposed timber and road activities are not expected to noticeably change foot travel access; although skid roads created in units harvested via conventional methods could be used for foot travel.

Proposed timber harvesting activities are likely to create additional habitat for wildlife that prefer temporary openings and edge (Wildlife effects). This could improve hunting potential in the area. Activities are not expected to adversely affect aquatic resources (Aquatic effects); thus fishing success is not expected to be noticeably affected.

Public closures or delays would likely occur while roads are being constructed, reconstructed, maintained, or abandoned and while trees are being felled and removed. However, impacts are expected to be short term. Traffic may be stopped for a few minutes if helicopters transporting timber must fly over open roads to access landings. Roads or sale units may be inaccessible while road work is completed or while trees are felled and removed from units.

Timber harvesting activities and road work would generate noise in localized areas at different times during the life of a timber sale. Recreation users in the area would notice such noise the most during the work week (Monday thru Friday).

Congressionally designated wilderness and wild and scenic rivers would not be affected, as none exist in or near the project area.

Direct/Indirect Environmental Consequences

Alternative A - No Action

Recreational opportunities would continue to include those listed in the affected environment. Recreation use is not expected to change noticeably. No developed recreation sites exist in the area, so there would be no effects. No change to the existing dispersed recreation site is

anticipated. The American Discovery Trail would continue to be managed in its current location along State Routes 21 and 17. Existing motorized use would continue, with no changes in public access. Existing roads would continue to be maintained as needed. FR 767, which is open during hunting season, would be maintained, which would provide the public better road conditions during the hunting season. Congressionally designated wilderness and wild and scenic rivers would not be affected as none exists in or near the project area.

Alternative B - Proposed Action
Public access could be limited on some acres proposed for two age harvest if fence has to be installed to prevent deer browse and ensure regeneration. Effects are expected to be temporary (less than seven years); fence would be removed after successful regeneration occurs.

Alternative C
No additional effects were identified except those common to All Action Alternatives.

Cumulative Impacts

Alternative A would not directly or indirectly affect recreation resources; thus, it would not contribute cumulatively to past, present, or future actions. Given how little Alternative B and C would impact recreation resources, they are not likely to contribute noticeably to the effects of past, present, and reasonably foreseeable future actions identified earlier in this chapter.

Past timber sales created diverse habitat for wildlife which may have improved hunting potential and improved foot travel on closed roads and skid roads. Both action alternatives would contribute somewhat to these effects. The temporary bridge installed on Valley Fork Run improved access for the public to the Pheasant Mountain Trail system just outside the project area. Alternative B and C would have no affects on trails.

Construction of Corridor H may impact public access in the area in the future, but the extent and duration are not known. It is possible there may not be any combined effects given construction is not anticipated until at least 2013 and because Alternative B and C are not expected to result in noticeable direct or indirect public access effects. Completion of the highway is expected to increase recreation use on the Forest, but not necessarily to this project area.

Unavoidable Adverse Impacts

None of the alternatives would cause unavoidable adverse impacts to recreation resources.

Irreversible or Irretrievable Commitment of Resources

None of the alternatives would result in irreversible or irretrievable impacts to recreation.

Consistency with the Forest Plan

All alternatives would be consistent with the Forest Plan goal of managing the spectrum of recreation opportunities that exist on the Forest with an emphasis on recreation activities such as hiking or hunting, and facilities to support that use (Forest Plan, p. 37). All alternatives are consistent with the Recreation Opportunity Spectrum designation for the Clover Run area, which is roaded-natural. None of the alternatives conflict with Forest Plan direction for recreation management (Forest Plan, pp. 63-66 and p. 130).

Scenery

Resource Impacts Addressed

This section answers questions the public had about how Lower Clover alternatives may impact visual resources in the Lower Clover project area.

Affected Environment

The Lower Clover project area is located within an existing landscape character of a northern hardwoods zone, which consists of the dissected Appalachian plateau at its juncture with the ridge and valley section. Landforms are rolling to steeply sloped mountains with narrow, winding valleys. Elevations within the project area view shed range from 1,700 feet at Parsons, WV, to about 2,540 feet above Jonathon Run. Visitors encounter mostly enclosed, foreground views; but a few distant panoramas exist.

Past and present activities identified earlier in Chapter 3 contributed to the scenery that exists in the project area. Northern hardwood forests are the rule across this zone, with mixed mesophytic vegetation at lower elevations. Pastures are common throughout the zone; and temporary openings of less than 25 acres, due to timber harvests, are common, as are changes in vegetative texture brought about by partial harvests, two age management. Mountain-sides within the zone typically have an even-textured appearance, often punctuated by temporary openings. The line introduced by road construction on mountain-sides is most evident during leaf-off periods.

Visitors will find a small dispersed camping area and opportunities for fishing and hunting. No developed sites exist in the area. The American Discovery Trail travels through the project area and is located entirely on system roads. There are no other trails within the project area.

The project area is located entirely in Management Prescription 3.0. This prescription allows for a variety of forest views in a primarily motorized recreation environment. The entire project area is located within a Roaded-Natural Recreation Opportunity Spectrum Setting. The Scenery Management System (SMS) Objectives are designed to blend with the natural character of the landscape (meet ROS objectives). A majority of the project area is located in areas of low visual concern with typical and indistinctive scenic attractiveness and a few small areas located within foreground high and middle-ground high which are high visual concern areas. The SMS table and map used for this analysis is located in the project file.

Desired Future Condition

The desired future condition for this area is a mosaic of stands of predominately hardwood trees and associated under-stories that provide habitat for a variety of wildlife species. Timber stands would vary in size, shape, height and species depending on the silvicultural system applied.

Scope of the Analysis

The scope of the analysis for all effects includes the recreation resources within the Lower Clover project area and potential visual quality effects from roads, trails, and dispersed recreation sites within or immediately adjacent to the area. Because the Forest provides a wide range of recreation opportunities, there are no recreation activities limited or specific to the Lower Clover project area. Therefore, any analysis beyond that described above is not necessary.

Methodology

Several materials were used to evaluate the effects of alternatives on the recreation resources within the analysis area, including the Landscape Aesthetics, Handbook for Scenery Management (Agriculture Handbook #701) and Recreation Opportunity Spectrum (ROS).

The Unit of measure that was used to analyze changes to the landscape was the number of units that are not consistent with the Scenic Integrity and Concern Levels. The primary viewpoints that were used to evaluate the effects of the alternatives on the scenic/visual quality resources within the project area include State Roads 72, 38, 6, 21, CR-17 and the American Discovery Trail (CR-17 and SR-21). Any proposed harvesting activities within the project area would either not be visible or would be in the background of Shingle Tree, Clover, and Pheasant Mountain Trails, and therefore visual/ scenery effects were not evaluated.

Environmental Consequences Common to All Action Alternatives

Some conventional and helicopter log landings may be developed in areas viewable from roads. Most would be constructed along Forest Service roads closed to public vehicular traffic, and only those walking in the area would view them. However, some landings, such as proposed landing C off WV 38, would be viewable from roads open to public motorized use. Drivers are likely to view logging equipment, piled logs and debris, and soils that may be compacted and/or rutted. Such views are expected to be short-lived since measures would be taken after timber harvesting is completed to address such conditions in foregrounds (see Chapter 2).

Direct/Indirect Environmental Consequences

Alternative A – No Action

Unless natural events such as wind throw, ice, disease, fire, etc. occur in the project area, the desired future condition for the analysis area would not be achieved. In the short term, the landscape would continue to consist of relatively closed canopy forested conditions with scattered openings. Over a long period of time, natural succession of trees and natural events could change the existing condition and may help create a mosaic of stands of predominately hardwood trees and associated under-stories that provide habitat for a variety of wildlife species.

Alternative B – Proposed Action

Portions of stands 14, 15, 29, and 55 are within a Rural ROS with all remaining stands located in Roaded Natural ROS. Portions of stands 29.1, 14.2, 14.3, 54, and 59 are within a Scenery Management System Distance Zone of Middle-ground 1 (MG-1) and portions of stands 14.1 and 14.2 are in a Fore-ground 1 (FG-1). Both of these zones are in a Typical Scenic Attractiveness Area where the Scenic Integrity Level is Moderate (partial retention). All remaining stands are located in typical low visual concern and scenic integrity level areas.

Generally, from the primary viewpoints identified above, most proposed timber harvesting activities (including stands 29.1, 54, and 59 MG-1) would either not be noticeable or only noticeable for a short duration while traveling along a road or the American Discovery Trail within the area. Harvesting activities within portions of stands 14.1 and 14.2 may be noticeable along short segments of WV-72 for a very short duration and for a relatively short period of time during the winter months (approximately 3-5 years); but they would have no adverse effects on the overall ROS or Scenic Attractiveness of the area.

The visual effects of these proposed harvesting activities would be more noticeable to hunters and other visitors using the open and closed forest roads within the project area to access specific recreation activities such as hunting and fishing.

The textured visual pattern of the area would be maintained, including a variety of permanent and temporary openings (agricultural and timber harvest) and an even textured appearance brought on by partial timber harvests.

Alternative C

Portions of stands 14, 15, 29, and 55 are within a Rural ROS with all remaining stands located in Roaded Natural ROS. Portions of stands 29.1, 14.2, 14.3, 54, and 59 are within a Scenery Management System Distance Zone of Middle-ground 1 (MG-1) and portions of stands 14.1 and 14.2 are in a Fore-ground 1 (FG-1). Both of these zones are in a Typical Scenic Attractiveness Area where the Scenic Integrity Level is Moderate (partial retention). All remaining stands are located in typical low visual concern and scenic integrity level areas.

Generally, from the primary viewpoints identified above, most proposed thinning activities (including stands 29.1, 54, and 59 MG-1) would either not be noticeable or only noticeable for a short duration while traveling along a road or trail in the area. It is not likely commercial thinning activities within portions of stands 14.1 and 14.2 would be noticeable along WV-72. There would be no adverse effects on the overall ROS or Scenic Attractiveness of the area.

The visual effects from commercial thinning activities may be more noticeable to hunters and other visitors, for a relatively short period of time (1-3 years) using the open and closed forest roads within the project area to access specific recreation activities such as hunting and fishing. The textured visual pattern of the area would be maintained, and implementing Alternative C would, over time, provide for larger tree characteristics.

Cumulative Impacts

Past and present recreation opportunities within the proposed Lower Clover Area consist primarily of dispersed recreation activities including: hunting, fishing, and some undeveloped camping. Recreation use within the area is low. Reasonably foreseeable future actions regarding recreation opportunities in the analysis area are expected to remain about the same. Recreation use of the area may increase slightly if Corridor H is built through or near the project area.

Implementing the No Action or Alternative B or C is not expected to result in cumulative effects to existing or future recreation opportunities or resources. Any effects to the scenic attractiveness of the area would be minimal and of a short duration (2-5 years). Recreation resources would continue to be preserved under all alternatives (Recreation effects). Timber harvesting and development is expected to continue on private lands consistent with a Rural ROS setting.

Unavoidable Adverse Impacts

Harvesting trees and constructing skid roads and roads would adversely affect existing scenery. The effects of harvesting trees and constructing skid road and temporary roads would last until revegetation occurs. The effects of constructing TR 125 would last as long as it is maintained as a road. Visual effects would be most noticeable to those walking through or by harvest units or along roads that are closed to public motorized use. A change in the overall scenic character of the area or existing recreation resources is not expected.

Irreversible or Irretrievable Commitment of Resources

No alternative would result in irreversible or irretrievable commitments of scenic resources.

Consistency with the Forest Plan

All proposed actions would be consistent with Forest Plan Management Prescription 3.0 standards and guidelines for recreation management (Forest Plan, pp. 127-128, and 130-132).

Special Uses

Resource Impacts Addressed

This section discloses how special uses authorized in the Lower Clover project area would be affected by proposed activities.

Affected Environment

Several special uses are authorized within the project area (Special Use information in project file). However, only a cultivation field is likely to be affected by proposed activities. The field is about 10 acres. It is located on the east side of WV 38, not far from the SR 21 intersection.

Scope of the Analysis

The spatial boundary used to evaluate direct, indirect, and cumulative effects was the boundary of the cultivation field. This boundary was used because effects of proposed activities are not anticipated to extend beyond the 10 acres authorized by the permit. Effects to the field are not expected to last beyond three year after implementation of the sale, about eight years from the date a timber sale is awarded. This temporal boundary was used because effects could occur anytime during the life of the proposed timber sale and could extend three years beyond the close of the sale because it could take time for disturbed soils to re-vegetate after seeding.

Methodology

The acreage and extent of impacts to the field was assessed by overlaying the special use maps with the Lower Clover alternative maps and considering the activities that would affect it.

Direct/Indirect Environmental Consequences

Alternative A – No Action

No action would be implemented, thus there would be no effect to special uses in the area.

Alternative B and Alternative C

Alternative B and C propose to create a helicopter service landing within the area authorized for cultivation (see potential landing "c" off SR 38 on the alternative maps). This landing is expected to be used during winter months, but the exact months, year, and duration that it would be used is not known.

About 1 ½ acres of the field could be disturbed and compacted as heavy equipment travels over it. A short temporary road would be constructed from WV 38 along the northern and eastern perimeter of the field. This road and the landing itself are likely to be rocked. Rocking could effectively prevent hay production of this 1 ½ acres in the short term (1-3 years from the time the area is rocked); and possibly the long term. This is because stone is likely to be pushed into the subsoil of the field, making it difficult to remove. It could take years for vegetation to grow through the rock; the length of time would depend on the depth and amount of soil compaction. If some of the acreage is not rocked, it could be hayed once compacted soils are ripped, seeded, and vegetated. It is likely to take time (several months to over a year) for vegetation to become well established.

Cumulative Impacts

Alternative A – No Action

Since it would not cause direct or indirect effects, it would not contribute cumulative effects.

Alterantive B and Alternative C
The Forest is not aware of any past, present, or reasonably foreseeable future actions on Federal or non-federal lands that may contribute cumulatively to the effects Alternative B or C would have on the cultivation field.

Unavoidable Adverse Impacts

Alternative B and C may result in unavoidable adverse impacts to the cultivation field in that rock placed on about 1 ½ acres of the field may prevent grass from growing back.

Irreversible or Irretrievable Commitment of Resources

There is no known irreversible or irretrievable commitment of special use resources.

Consistency with the Forest Plan

All alternatives would be consistent with Forest Plan direction for special use management (Forest Plan, pp. 88 and 138a).

Consistency with Laws

None of the alternatives threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment. As documented in this EA or in the project file, alternatives would be consistent with the following applicable laws and Executive Orders:

American Indian Religious Freedom Act of 1978
Antiquities Act of 1906 (16 USC 431-433)
Archaeological and Historical Conservation Act of 1974 (16 USC 469)
Archaeological Resources Protection Act of 1979 (16 USC 470)
Cave Resource Protection Act of 1988
Clean Air Act of 1977 (as amended)
Clean Water Act of 1977 (as amended)
Endangered Species Act (ESA) of 1973 (as amended)
Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 (as amended)
Historic Sites Act of 1935 (16 USC 461-467)
Multiple Use Sustained Yield Act of 1960
National Environmental Policy Act of 1969, (as amended) (42 USC 4321-4347)
National Forest Management Act (NFMA) of 1976 (as amended)
National Historic Preservation Act of 1966 (16 USC 470)
Organic Act 1897
Wild and Scenic Rivers Act of 1968, amended 1986
Forest Service Manuals such as 2361, 2520, 2670, 2620, 2760
Executive Order 11593 (cultural resources)
Executive Order 11988 (floodplains)
Executive Order 11990 (wetlands)
Executive Order 12898 (environmental justice)
Executive Order 12962 (aquatic systems and recreational fisheries)
Executive Order 13112 (NNIS)